

**GRAND CANYON PROTECTION ACT AND RENAMING
THE SALT-GILA AQUEDUCT AS THE FANNIN-
McFARLAND AQUEDUCT**

HEARING
BEFORE THE
SUBCOMMITTEE ON WATER AND POWER
OF THE
COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
ONE HUNDRED FIRST CONGRESS
SECOND SESSION

ON

S. 1556

TO DESIGNATE THE SALT-GILA AQUEDUCT OF THE CENTRAL ARIZONA
PROJECT AS THE "FANNIN-McFARLAND AQUEDUCT"

S. 2807

TO DIRECT THE SECRETARY OF THE INTERIOR TO ESTABLISH AND IM-
PLEMENT POWER OPERATING CRITERIA AT GLEN CANYON DAM, TO
PROTECT THE ENVIRONMENTAL AND RECREATIONAL RESOURCES OF
GRAND CANYON NATIONAL PARK, AND FOR OTHER PURPOSES

JULY 24, 1990



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GRAND CANYON PROTECTION ACT AND RENAMING THE SALT-GILA AQUEDUCT AS THE FANNIN-McFARLAND AQUEDUCT

TUESDAY, JULY 24, 1990

U.S. SENATE,
SUBCOMMITTEE ON WATER AND POWER,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The subcommittee met, pursuant to notice, at 11:04 a.m., in room SD-366, Dirksen Senate Office Building, Hon. Bill Bradley, presiding.

OPENING STATEMENT OF HON. BILL BRADLEY, U.S. SENATOR FROM NEW JERSEY

Senator BRADLEY. The subcommittee will come to order.

I apologize to all those who have come so far and who have waited so long. Unfortunately, one cannot plan the actions of the Senate, and the amendment which was supposed to come up at 9 this morning was delayed till 9:45. It was my amendment. I happened to have worked on it for a year. So, I had to be there. And I lost too.

[Laughter.]

Senator McCAIN. Not because of me, Mr. Chairman.

Senator BRADLEY. No, that is true. That will not reflect on this hearing.

The story of the modern American West is the story of dams and reservoirs, human ingenuity making an arid landscape livable. Of the thousands of water projects ranging from pioneer built reservoirs for a single small town to engineering marvels like Glen Canyon that bring water and life to wide regions, more than 600 owe their existence to the Bureau of Reclamation.

One of these projects, Glen Canyon Dam, stands out because it reshaped our Nation's thinking about the objectives and methods of the Bureau and the protection our rivers deserve. Glen Canyon Dam was in many ways the catalyst for the modern environmental movement. In the late 1950's and early 1960's, an alternative plan to build a dam upstream on the Colorado at Echo Park, which would have backed waters into the Dinosaur National Park, provoked the first national opposition movement to a dam project. The Sierra Club, which had only one paid staff member before the Echo Park controversy, expanded rapidly, and the school children who read My Weekly Reader joined a letter writing campaign to save Dinosaur Park.

Conservation groups endorsed construction of Glen Canyon Dam as a preferable alternative. Within a few years, though, many of these groups came to see the deal as a tragic error which cost the Nation one of the most spectacular canyons, and flooded the national monument at Rainbow Bridge.

The nationwide backlash against dam projects and the widely held sense that the Grand Canyon itself was at risk, stymied the Bureau's plans in the 1960's to build two more dams downstream on the Colorado at Marble Canyon and Bridge Canyon. These were bitter defeats for the Bureau and most would agree that they marked the end of the long era of unfettered dam building in the American West.

It also marked the beginning of a new era, one in which we strive to balance the economic benefits of water projects against our obligation to the environment. Today, more than 27 years after Lem Wiley, the project manager, closed three steel gates and stopped the Colorado River at Glen Canyon on March 13, 1963, we are here to address the ongoing and complex question of this dam's responsibility to the canyon that it spans, the river that it impounds and the human needs it serves. At issue are interstate water allocation, power supply, and the protection of our most famous park and natural wonder.

Glen Canyon Dam is the keystone of the Colorado River Storage Project, or "CRSP," which, in turn, is the central vehicle for implementation of the Colorado River Compact, a congressionally affirmed pact by which the three States of the lower Colorado River Basin and the four States of the upper basin share the water and the power of this river.

The dam supplies clean hydropower for public utilities throughout the Southwest. Those power revenues fund CRSP irrigation and water supply projects in Utah, Colorado, New Mexico, and Wyoming. Since all of the States of the CRSP are represented on this committee, we should be able to address all these issues without upsetting the delicate balance of benefits for each part of the basin.

Since it began filling in the 1960's, Glen Canyon Dam has been operated primarily to serve water allocation and power interests. But the dam impounds the Colorado River just 30 miles above Grand Canyon National Park. Its operation affects the quality and quantity of river water, the habitat of native and introduced species, the recreational use of the river, and other things.

Today we are asked to consider the degree to which the dam's operations must accommodate downstream environmental and recreational purposes. Like many western water projects, Glen Canyon Dam was built in an era when these were not concerns, but we are now operating in a new era of heightened environmental worries, an era which began with the building of this dam.

Senator McCain and Senator DeConcini recently introduced their answer to these questions in the form of S. 2807, the Grand Canyon Protection Act of 1990. I will let my colleagues from Arizona explain their intentions for the bill in more detail. I am pleased to be a co-sponsor of their legislation because I believe that operation of the dam can and must provide more protection for the downstream environment, including the Grand Canyon National Park.

At the same time, my responsibility as Chairman of this subcommittee is to ensure that Congress does not unwittingly alter the careful arrangements under which the seven States of the Colorado River Basin share the river's limited water. I am confident that we can achieve both goals.

Before beginning the hearing itself, I would like to say that the subcommittee is honored today by the presence of Stewart Udall who, as a Congressman, supported the Glen Canyon Dam and later, as Secretary of the Interior, oversaw the dam's completion and first years of operation. On September 22, 1966 at the dedication of the completed dam, Secretary Udall said, "There is something very precious and very special that all of us have here. This heritage is so much richer than we know, and we must conserve it and use it wisely."

Remembering those words, I would ask former Secretary Udall and our other witnesses to use this hearing to tell us how the Nation should most wisely use the rich heritage represented by the dam, the beautiful reservoir above, and the irreplaceable park and river below.

I see Senator Wallop here. Do you have any opening statement?
[The texts of S. 1556 and S. 2807 follow:]

101ST CONGRESS
1ST SESSION

S. 1556

To Designate the Salt-Gila aqueduct of the Central Arizona Project as the
"Fannin-McFarland Aqueduct".

IN THE SENATE OF THE UNITED STATES

AUGUST 4, (legislative day, JANUARY 3), 1989

Mr. DECONCINI (for himself and Mr. MCCAIN) introduced the following bill;
which was read twice and referred to the Committee on Energy and Natural
Resources

A BILL

To Designate the Salt-Gila aqueduct of the Central Arizona
Project as the "Fannin-McFarland Aqueduct".

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*
3 That (a) The Salt-Gila aqueduct of the Central Arizona
4 project, constructed, operated, and maintained under section
5 301(a)(7) of the Colorado River Basin Project Act (43 U.S.C.
6 1521(a)(7)), hereafter shall be known and designated as the
7 "Fannin-McFarland Aqueduct".

8 (b) Any reference in any law, regulation, document,
9 record, map, or other paper of the United States to the aque-

5

2

1 duct referred to in subsection (a) hereby is deemed to be a
2 reference to the "Fannin-McFarland Aqueduct".

○

101ST CONGRESS
2D SESSION

S. 2807

To direct the Secretary of the Interior to establish and implement power operating criteria at Glen Canyon Dam, to protect the environmental and recreational resources of Grand Canyon National Park, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JUNE 28 (legislative day, JUNE 11), 1990

Mr. McCain introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

A BILL

To direct the Secretary of the Interior to establish and implement power operating criteria at Glen Canyon Dam, to protect the environmental and recreational resources of Grand Canyon National Park, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the "Grand Canyon Protection
5 Act of 1990".

6 **SEC. 2. FINDINGS.**

7 The Congress finds that—

1 (1) current operational practices at Glen Canyon
2 Dam, including fluctuating water releases made for the
3 enhanced production of "peaking" hydroelectric power,
4 and flood releases, have substantial adverse effects on
5 downstream Colorado River environmental and recre-
6 ational resources, including resources in Grand Canyon
7 National Park;

8 (2) the Secretary of the Interior (referred to as
9 "the Secretary") announced on July 27, 1989, the
10 preparation of an environmental impact statement to
11 evaluate the impacts of Glen Canyon Dam operations
12 on downstream Colorado River environmental and rec-
13 reational resources;

14 (3) Based on existing information and with infor-
15 mation developed during preparation of the environ-
16 mental impact statement, the Secretary will be able to
17 make informed decisions regarding possible changes to
18 current power operational criteria and practices for
19 Glen Canyon Dam and to take other measures to pro-
20 tect, mitigate adverse impacts to, and improve the con-
21 ditions of downstream environmental and recreational
22 resources;

23 (4) the substantial adverse effects of current
24 power operations of Glen Canyon Dam can be at least
25 partially mitigated by the development and implemen-

1 tation of interim power operating criteria pursuant to
2 section 4, pending development of power operating cri-
3 teria pursuant to section 5 of this Act; and

4 (5) the Act of August 25, 1916 (39 Stat. 535,
5 chapter 408; 16 U.S.C. 1 et seq.) (commonly known as
6 the "National Parks Organic Act"), the Act of April
7 11, 1956 (70 Stat. 105, chapter 203; 43 U.S.C. 620
8 et seq.) (commonly known as the "Colorado River
9 Storage Project Act"), the Colorado River Basin
10 Project Act (43 U.S.C. 1511 et seq.), the Endangered
11 Species Act of 1973 (16 U.S.C. 1531 et seq.), and
12 other Federal laws require the Secretary of the Interi-
13 or to operate Glen Canyon Dam in such a manner as
14 to protect, mitigate adverse impacts to, and improve
15 the conditions of the natural resources of Grand
16 Canyon National Park and Glen Canyon National
17 Recreation Area, in a manner consistent with the
18 water storage and allocation purposes of the Glen
19 Canyon Dam established pursuant to the Colorado
20 River Compact, consented to by the Act of August 19,
21 1921 (42 Stat. 171, chapter 71) and approved by sec-
22 tion 13 of the Act of December 21, 1928 (45 Stat.
23 1064, chapter 42) and other laws relating to regulation
24 of the Colorado River.

1 SEC. 3. PROTECTION OF GRAND CANYON NATIONAL PARK.

2 The Secretary of the Interior shall operate Glen Canyon
3 Dam in such a manner as to protect, mitigate adverse im-
4 pacts to, and improve the conditions of the natural resources
5 of Grand Canyon National Park and Glen Canyon National
6 Recreation Area, under operating criteria that are consistent
7 with the water storage and delivery functions of Glen
8 Canyon Dam pursuant to the Colorado River Compact, the
9 Upper Colorado River Basin Compact, consented to by the
10 Act of April 6, 1949 (63 Stat. 31, chapter 48), and other
11 laws relating to allocation of the Colorado River.

12 SEC. 4. INTERIM POWER OPERATING CRITERIA FOR GLEN
13 CANYON DAM.

14 (a) IN GENERAL.—(1) Not later than 30 days after the
15 date of enactment of this Act, the Secretary shall determine
16 whether the scientific data that are available as of that date
17 are sufficient to permit the implementation of interim power
18 operating criteria for Glen Canyon Dam that would, without
19 impeding the conduct of research flows for the purpose of
20 completing the environmental impact statement, increase the
21 protection and improvement of the condition of the natural
22 resources of Grand Canyon National Park and Glen Canyon
23 National Recreation Area.

24 (2) If, pursuant to paragraph (1) the Secretary deter-
25 mines that the available scientific data are reasonably suffi-
26 cient to permit the implementation of the interim power oper-

1 ating criteria described in paragraph (1), the Secretary shall
2 implement such criteria not later than 30 days thereafter.

3 (3) If, pursuant to paragraph (1) the Secretary deter-
4 mines that the scientific data are not reasonably sufficient to
5 permit the implementation of the interim power operating cri-
6 teria described in paragraph (1), the Secretary shall—

7 (A) submit a report to Congress stating the nature
8 of the scientific data that are lacking so as to preclude
9 the immediate implementation of interim power operat-
10 ing criteria pursuant to paragraph (2);

11 (B) proceed as quickly as possible to procure such
12 data; and

13 (C) implement such criteria not later than 30 days
14 after adequate scientific data become available, and in
15 no event later than the earlier of—

16 (i) 30 days after the cessation of research
17 flows for the purpose of completing the environ-
18 mental impact statement; or

19 (ii) September 1, 1991.

20 (b) OBJECTIVES.—The interim power operating criteria
21 described in subsection (a) shall be designed to—

22 (1) not interfere with the water storage and deliv-
23 ery functions of Glen Canyon Dam pursuant to the
24 Colorado River Compact, the Upper Colorado River

1 Basin Compact, and other laws relating to regulation
2 of the Colorado River;

3 (2) minimize the adverse environmental impacts of
4 Glen Canyon Dam operations on Grand Canyon Na-
5 tional Park and Glen Canyon National Recreation
6 Area downstream of Glen Canyon Dam;

7 (3) adjust fluctuating water releases used for the
8 production of peaking hydroelectric power and adjust
9 rates of flow changes for fluctuating flows that will
10 minimize adverse downstream impacts;

11 (4) minimize flood releases, consistent with sec-
12 tion 3;

13 (5) maintain sufficient minimum flow releases from
14 Glen Canyon Dam to minimize—

15 (A) adverse environmental impacts of Glen
16 Canyon Dam operations on Grand Canyon Na-
17 tional Park and Glen Canyon National Recre-
18 ational Area downstream of Glen Canyon Dam;
19 and

20 (B) protect fishery resources; and

21 (6) limit maximum flows released during normal
22 operations to—

23 (A) minimize the adverse environmental im-
24 pacts of Glen Canyon Dam operations on Grand
25 Canyon National Park and Glen Canyon National

1 Recreation Area downstream of Glen Canyon
2 Dam; and

3 (B) protect fishery resources.

4 (c) CONSULTATION AND PUBLIC PARTICIPATION.—

5 The Secretary shall develop and implement the interim
6 power operating criteria described in subsection (a) in consul-
7 tation with—

8 (1) appropriate agencies of the Department of the
9 Interior, including the Bureau of Reclamation, United
10 States Fish and Wildlife Service, and the National
11 Park Service;

12 (2) the Secretary of Energy;

13 (3) the Governors of the States of Arizona, Cali-
14 fornia, Colorado, Nevada, New Mexico, Utah, and
15 Wyoming; and

16 (4) Indian tribes;

17 and with the full participation of the general public, including
18 representatives of environmental organizations, the recrea-
19 tion industry, and contractors for the purchase of Federal
20 power produced at Glen Canyon Dam.

21 (d) RELIANCE ON DATA.—The Secretary shall develop
22 and implement the interim power operating criteria described
23 in subsection (a) using the best and most recent scientific data
24 available.

1 (e) **TERMINATION.**—The interim power operating crite-
2 ria shall terminate upon compliance by the Secretary with
3 section 5.

4 (f) **DEVIATION FROM CRITERIA.**—The Secretary may
5 deviate from the interim power operating criteria described in
6 subsection (a) upon a finding that such deviation is necessary
7 and in the public interest—

8 (1) to comply with the requirements of section 3;

9 (2) to respond to hydrologic extremes or power
10 system operating emergencies; or

11 (3) to further reduce adverse impacts on down-
12 stream Colorado River environmental and recreational
13 resources.

14 **SEC. 5. GLEN CANYON DAM ENVIRONMENTAL IMPACT STATE-**
15 **MENT; POWER OPERATING CRITERIA FOR GLEN**
16 **CANYON DAM.**

17 (a) **STUDIES.**—(1) Not later than 3 years after the date
18 of enactment of this Act, the Secretary shall complete a final
19 Glen Canyon Dam Environmental Impact Statement, in ac-
20 cordance with the National Environmental Policy Act of
21 1969 (42 U.S.C. 4321 et seq.).

22 (2) The Comptroller General shall audit the costs and
23 benefits to water and power users and to recreational and
24 environmental values of management policies and operating

1 criteria identified pursuant to section (a)(1) and report the
2 results of the audit to the Secretary and the Congress.

3 (b) OPERATING CRITERIA.—(1) Based on the findings,
4 conclusions, and recommendations made in the studies and
5 the statement prepared pursuant to subsection (a)(1) and the
6 audit performed pursuant to subsection (a)(2), the Secretary
7 shall implement power operating criteria for Glen Canyon
8 Dam that will ensure that Glen Canyon Dam is operated in a
9 manner consistent with this Act.

10 (c) REPORT.—Upon adoption of permanent power oper-
11 ating criteria under subsection (b), the Secretary shall submit
12 to the Congress—

13 (1) the environmental impact statement described
14 in subsection (a); and

15 (2) a report describing the power operating crite-
16 ria and other measures taken to protect, mitigate ad-
17 verse impacts to, and improve the condition of the en-
18 vironmental and recreational resources of the Colorado
19 River downstream of Glen Canyon Dam.

20 (d) COSTS OF PREPARING ENVIRONMENTAL IMPACT
21 STATEMENT.—All direct costs of preparing the environmen-
22 tal impact statement described in subsection (a) shall be non-
23 reimbursable.

1 SEC. 6. LONG TERM MONITORING.

2 The Secretary of the Interior shall establish and imple-
3 ment long-term monitoring requirements that will ensure that
4 Glen Canyon Dam is operated in a manner consistent with
5 the requirements of section 3.

6 SEC. 7. AUTHORIZATION OF APPROPRIATIONS.

7 There are authorized to be appropriated such sums as
8 are necessary to carry out this Act.

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STATEMENT OF HON. MALCOLM WALLOP, U.S. SENATOR FROM
WYOMING

Senator WALLOP. Mr. Chairman, if I may, and I will not take lots of the committee's time.

But I have concerns about a bill which entitles itself "the Grand Canyon Protection Act" on its face because I think it is a specific attempt to attract emotion to an argument which the bill and its sponsors do not make. The name is an oversimplification which I think implies that if Congress does not act, then the canyon will not be protected. And in my opinion that simply is not so, and there is no one here today, also in my opinion, who does not want to see the protection of the Grand Canyon or the Glen Canyon National Recreation Area.

But the fact of the matter is that the Secretary already has adequate authority to provide protection for these valuable resources. Most importantly, he is proceeding in a manner which will ensure that he has sufficient scientific data to impose flows in a thoughtful way by directing that an Environmental Impact Statement be prepared to determine the effect of the operation of Glen Canyon Dam on downstream environmental and ecological resources. It is premature for Congress to step in now, to short-circuit the process of the environmental impact statement, to single out one or two resources to the exclusion of all others.

The thing I would pray that we have, Mr. Chairman, is a little patience. We seem to be quite willing to act with impatience. The Congress set up a process to determine the nature of risk, of impact, of its consequence and its mitigation, and now before we get that information, we reject it. We simply are setting out to act. And in my opinion, the Congress needs to move on purpose and not on emotion, to do actual good and not political good. Congress, as you warned us in your opening remarks, which I thought were thoughtful, Mr. Chairman, Congress ought not to unwittingly precipitate consequences which it will later have to come back to correct. And I am afraid that that is precisely what we set out to do—acting before we have the information. We are running the high risk of unwittingly doing things that cause great economic and possible great environmental risk and damage.

Now, the Secretary of the Interior, as Secretary Udall will know, has an extraordinarily difficult balancing act to perform on the Colorado River. He has a number of legitimate and oftentimes conflicting interests and obligations. For example, there are two Indian tribes, the Havasupai and the Hualapai, in the area which should be here, testifying on this bill. In addition, he must consider international treaties, he must consider court decisions and statutory directives, and must deal with such things as endangered species and wildlife refuges. Flood control, river regulation, power production, water quality, and beneficial uses all have to be weighed, in addition to the recreational and environmental value.

And that is the purpose of the environment impact statement, to put all those things in perspective, to see what risks there are and to see what mitigation can be brought to bear on it, and to act with knowledge and not with emotion. The Secretary has the power to use his discretion to protect all of these interests now. The EIS will

give him the information necessary to make those delicate decisions in an informed and intelligent manner. And it would be my hope that we wait until we have the adequate information before we act.

Mr. Chairman, I thank you very much for your time and also for holding the hearing.

Senator BRADLEY. Thank you, Senator Wallop, for your comments. I hope that the hearing will address some of your questions.

Senator McCain, welcome to the subcommittee, and you may proceed.

STATEMENT OF HON. JOHN MCCAIN, U.S. SENATOR FROM ARIZONA

Senator MCCAIN. Thank you, Mr. Chairman. I know you have lots of witnesses, so I will try to be brief.

I also share your recognition of Stewart Udall, one of the great Arizonans. The Udall family has contributed in an incredible fashion to our State and to our Nation, and we are very proud to have the opportunity of knowing them.

Also, Mr. Chairman, later on you are going to take up a small bill that my colleague, Senator DeConcini and I have proposed to rename the Salt-Gila Aqueduct the Fannin-McFarland Aqueduct. I appreciate your prompt consideration of that bill.

And I would like to thank you, Mr. Chairman, for your involvement in our Grand Canyon. We are very grateful that someone who is perhaps not from our part of the country has taken an interest and commitment to this great national treasure and we are very grateful for it.

Mr. Chairman, before I go on to my statement, I would just like to respond very briefly to my friend from Wyoming, who has in-depth, thorough knowledge of many of these issues, which I clearly admit that I do not have, particularly where overall water issues are concerned.

Let me quickly add that I know a great deal about the Grand Canyon. I know a great deal about the history of the studies that were and were not conducted. I also know a great deal about the conditions that exist within the Grand Canyon as we speak. And I would like to remind my friend from Wyoming that these studies were ordered by James Watt back in 1981. A year ago, the proposal, we were told, within the Department of the Interior was simply to conduct more studies in an open-ended fashion. It was pressure of Congress, in all candor, my friend, that brought about the ordering of an EIS.

And when we talk about acting out of ignorance and not with enough scientific data, I can assure you that there will be witnesses to follow who have compelling evidence, scientific evidence, that enormous damage has been already done to the canyon. There is clearly sufficient evidence to warrant this relatively modest piece of legislation so that we can prevent further irreparable damage, not only to the beaches and the habitat, but also to various endangered species.

And I might add there is nothing in this bill which would not be subject to the Colorado River Compact, and we would in no way

contemplate upsetting that very delicate balance of agreement between the upper and lower Basin States.

Mr. Chairman, as you know, Arizona is proudly known as the Grand Canyon State. The title symbolizes not only our great pride, but our profound responsibility. The Grand Canyon, after all, is a unique and irreplaceable gift not just to Arizonans or Americans, but to all the people of the world, past, present, and future.

I know most of the people in this room have had the good fortune to experience the Grand Canyon. Those who have understand just what a special place it is. For those who have not, I will refrain from trying to describe its magnificence. Frankly, I have found such an endeavor an impossible task and doubt whether there are words in the English language to achieve it. Anyone who has beheld a sunrise at Navajo Point, hiked the back country on the Tanner Trail or run the rapids at Lava Falls understands the frustration of trying to describe the indescribable, so I shall not try.

Suffice it to say, the Grand Canyon is unlike anything in the world, a timeless natural treasure which we have a moral duty to care for and protect. Fulfilling that trust responsibility is what the Grand Canyon Protection Act is all about. This legislation seeks to help remedy a serious environmental threat to the canyon. I am talking about the degradation of its natural resources due to current operational practices at Glen Canyon Dam, a structure located on the Colorado River 30 miles upstream from Grand Canyon National Park.

In a report released in January 1988, the Department of the Interior determined that certain aspects of dam operations, including widely fluctuating flows to produce hydroelectric peaking power, are having a substantial adverse impact on a variety of downstream environmental and recreational resources, including resources within the Grand Canyon National Park. The impacts include the erosion of Colorado River beaches, degraded habitat for endangered fish species, as well as adverse effects on a blue ribbon trout fishery and white water river rafting. The good news is that many of these impacts can be mitigated by employing more responsible operating practices at the dam.

The Grand Canyon Protection Act will facilitate these needed changes in four important ways.

First, the bill requires the Secretary of the Interior as manager of the dam to ensure that dam operations protect, mitigate damages to and, if possible, improve the condition of the natural resources of the Grand Canyon.

Second, the bill provides for the timely completion of an environmental impact statement on the dam operations. This study will provide the Secretary with the scientific data he needs to make responsible operational decisions and to fulfill his duty to protect the canyon.

Third, because the EIS process is expected to take up to 3 years to complete, the bill calls on the Secretary to implement protective interim flows to mitigate adverse environmental impacts while the search for long-term solutions is under way.

Finally, the bill requires the Secretary to develop and implement a long-term monitoring program to ensure we continue to meet our stewardship responsibilities in the future.

In sum, Mr. Chairman, the bill will place us irreversibly on the road to making lasting and meaningful improvements to reconcile the dam with the canyon environment.

Let there be no mistake. Glen Canyon Dam has provided and will continue to provide many benefits, clean and dependable energy to light countless homes and to help power the region's tribal, municipal and industrial growth, water for people to survive and for our crops to grow, and recreational opportunities for millions. The mighty Colorado and the Glen Canyon Dam have provided us with very special gifts, indeed, supporting a wide array of interests and uses.

This legislation does not suggest that we forego these innumerable benefits. In fact, the bill states categorically that the dam's water storage and delivery function shall not be interfered with. This legislation merely ensures that we put our priorities back into perspective. It will ensure that we do not allow our constructive use of one important resource to become an abuse of another, particularly the Grand Canyon.

I know, Mr. Chairman, this is not a perfect bill. A number of expert witnesses will follow with what I am sure will be illuminating perspectives on this bill and the underlying issues. We all want to protect the canyon. Finding the proper means of achieving that goal is our challenge. I look forward to hearing their testimony and to working with the members of the committee to product the best and most responsible final product.

In conclusion, Mr. Chairman, I would like to remember Theodore Roosevelt, one of the first and most dedicated supporters of the Grand Canyon. It was almost 90 years ago that President Roosevelt stood at the edge of the Grand Canyon and marveled at the magnificence he beheld. Moved by its grandeur, the President admonished those assembled. "Leave the Canyon as it is," he said. "You cannot improve on it, the ages have been at work on it, and man can only mar it. What you can do is to keep it for your children, your children's children, and for all who come after you." These simple words articulate the responsibility with which we, the present-day stewards of the Grand Canyon, have been vested. Let us fulfill that responsibility faithfully.

Thank you, Mr. Chairman, and I appreciate again your interest and involvement with our great national treasure.

Senator BRADLEY. Senator McCain, let me thank you for your leadership on the issue and for your obvious concern and care about this vital local, regional, and National issue.

Although the Statue of Liberty sits in New Jersey waters, it is your Statue of Liberty as much as it is my Statue of Liberty. The Grand Canyon, of course, sits in your State by and large, and it is your canyon, it is also the Nation's canyon. It is with that respect and recognition of its national significance that this hearing and your testimony takes on an added importance. Let me thank you very much.

Senator McCAIN. Thank you, Mr. Chairman.

Senator WALLOP. Mr. Chairman, let me just assure my friend from Arizona. I do know the canyon. I have been down it three times. I have the greatest respect for it and for you and for the purposes for which the bill is here. My question is as to the timing of it, and the ability to act with certainty rather than with emotion.

Senator MCCAIN. I thank my friend from Wyoming. I have had the pleasure of visiting some of his beautiful State as well, and I hope he will come back down and maybe the three of us can go down again next summer. Thank you.

Senator BRADLEY. Thank you very much.

Our next witness is the Honorable Stewart Udall. There are few people in America who might be labeled a wise man, and I think Stewart Udall is one of them. The subcommittee is very pleased that you would take the time, Mr. Secretary, to be here today with us.

STATEMENT OF HON. STEWART UDALL, FORMER SECRETARY OF THE INTERIOR

Mr. UDALL. Thank you, Mr. Chairman. I want to set a model of brevity. I understand what is going on on the Hill this afternoon. For 8 wonderful years, I spent a substantial part of my time in this room, and as was my habit, I never read a statement, and I am not going to break that record today. I am going to try to be very brief and terse.

As a freshman Congressman—in fact, I was wondering. Was it in this room? I do not think this building existed in 1956. I think it was 1958 or 1959 when it came into existence. I was a freshman Congressman. I helped write the legislation. I voted for the upper Colorado storage project. My recollection is Senator Clinton Anderson from New Mexico, who was the Senator who was from the upper basin and provided the leadership; on the House, Congressman Aspinall, Congressman Claire Engle, later United States Senator from California. They are all gone, and I feel as though I am maybe plucked out of the wastebasket of history to come here today.

[Laughter.]

Mr. UDALL. But to me, Senator, this is very simple. This legislation raises two issues.

One is: Have the Secretaries of the Interior in recent years misinterpreted the 1956 act? This act talked about firm power. I happened to have been fortunate because I was deeply involved in the electric power business. The whole scene has changed from that period. Peaking power, as it is used today, was not a practice in the industry. I have gone back and I looked at the record, and I have had others search the records of those hearings. There was no mention in the record, in the reports, in the legislation about peaking power and what emerged as a way to enhance the value of the hydroelectric resource. And if, indeed, Congress did not contemplate this, then the opinions that have been rendered and the administrative decisions saying we were instructed to give paramount importance to enhancing the revenues from hydroelectric power—I do

not think we intended that in 1956. I do not think the legislation or the report says that.

And as I read this legislation, it is very simple. Should Congress, when a law has been misinterpreted with rather important consequences, come back and write a few words and say, no, that has been misinterpreted? I think this is the essence of this legislation.

There is one other thing, and it is not in my testimony, which I hope you will print in the record and accept. This interpretation, this damage that has been done—and I went through the river only once. I was Secretary of the Interior, and I was looking at the problem of the other dams. I went through in 1967. There were a lot of wonderful sand beaches there. That is where you camped out. It was part of the wonder of that canyon. Those were, of course, deposited from the floods and the streams that came down out of the Wyoming and Colorado mountains and brought the big spring floods.

It seems to me, although we did not have the vision or the imagination to think ahead, actually this is an impairment. This operation that is going on now and has been for many years—and Secretaries have been sitting and the Park Service which should have been fighting this all the way has been quiescent. Actually it violates the National Park Act. The National Park Act was passed in 1916, and that act said protect, use, but do not impair. And we have seen through the operation of Glen Canyon Dam a massive impairment of a national park.

And I think this cries out for Congress, if indeed this is a fact—I do not think there is any question about it—to take the kind of action that is proposed here. I agree with Senator Wallop. I do not think you should interfere with the process of the environmental impact statement that is moving forward. But when you have an impairment of not just an ordinary national park—this is one of the national park system, along with Yellowstone and so on—this lends a bit of urgency.

I find myself dismayed. I would like to be Secretary of the Interior for about 1 week, and I think I would institute a procedure that would shorten this environment impact process. They now try to see how long. Well, it will take us 3 years. You could do it in 3 months in terms of this issue, which the Secretary of the Interior ought to know about.

So, those are the thoughts of an old-timer, Senator. And I think this is a crisp piece of legislation directed at a specific problem, and I commend you for sponsoring it.

I am delighted to be here today. Thank you.

[The prepared statement of Mr. Udall follows:]

PREPARED STATEMENT OF HON. STEWART UDALL, FORMER SECRETARY OF THE
INTERIOR, ON S. 2807

Mr. Chairman and members of the subcommittee. I am delighted to be here this morning. Thank you for inviting me to testify concerning the Grand Canyon Protection Act of 1990.

I strongly endorse the essential provisions of S. 2807, and I want to begin my testimony by thanking Senator McCain and Senator DeConcini for their leadership in introducing this important legislation. I also want to thank you, Mr. Chairman, for scheduling this hearing to explore fully the issues presented by S. 2807.

Glen Canyon Dam looms large in both my public and personal life. For me, Glen Canyon Dam spans two different eras in the history of how we manage our nation's resources. I was a young Representative from Arizona thirty four years ago when Congress authorized the construction of Glen Canyon Dam by enacting the Colorado River Storage Project Act in 1956. I was Secretary of the Interior in 1963 when the gates on Glen Canyon Dam closed, blocking the free flow of the magnificent stretch of the great Colorado River through the Grand Canyon. Unbridled confidence in our technology, engineering, and unlimited capacity to make nature bend to our will marked this era.

I also served as the Secretary of the Interior during the 1960's when, as Glen Canyon Dam was nearing completion, the American people began to alter their thinking about the environment and forced political leaders to recognize a new era. Congress passed the Wilderness Act, the Land and Water Conservation Fund, the first endangered species act, and the Wild and Scenic Rivers Act. Senator Jackson and I worked together to start action that led to the passage of the National Environmental Policy Act. Conservationists like Martin Litton, to their eternal good credit, blocked—I hope forever—the building of two additional dams in the Grand Canyon. Most of us . . . although unfortunately not all of us . . . learned that hidden canyons and free flowing rivers, and the abundance and diversity of plant and animal life that they support, stand at least equal on the American people's scale of values to monumental dams and cheap hydroelectric power.

As a native of one of the Lower Basin states, Arizona, and now a citizen of one of the Upper Basin States, New Mexico; as a lawyer in private practice; as a member of the Board of Directors of the Grand Canyon Trust and the Advisory Board of American Rivers; and—most of all—as a father, grandfather, and concerned citizen who cares deeply about the Colorado River and the unique and spectacularly beautiful American land through which it flows, I have followed closely the history of Glen Canyon Dam and the long, frustrating, and continuing controversy over the manner in which the dam is operated that brings us together here this morning.

Thus, Mr. Chairman, I know full well that Glen Canyon Dam evokes a fighting spirit and strong words from people of good will representing a wide range of interests. My purpose in testifying this morning is not to rekindle old debates and antagonisms about Glen Canyon Dam and the wisdom, or lack thereof, of building it. Rather, I am here to express my strong support for the Grand Canyon Protection Act of 1990 which addresses a resource management decision that is real, immediate, and critical and which I believe is necessary to protect one of the greatest natural wonders on our planet, the Grand Canyon of the Colorado River.

From my perspective, Mr. Chairman, the Grand Canyon Protection Act of 1990 addresses two fundamental underlying issues with respect to Glen Canyon Dam operations.

First, the legislation sets a clear direction and establishes priorities for the Secretary of Interior when he determines operating criteria for Glen Canyon Dam. The requirement in Section 3 of the legislation that "the Secretary of the Interior shall operate Glen Canyon Dam in such a manner as to protect, mitigate adverse impacts to, and improve the conditions of Grand Canyon National Park and Glen Canyon National Recreation Area . . ." cuts to the heart of the problem that has plagued this issue for many years.

I must state to you candidly that I am baffled by the Western Area Power Administration's ("WAPA") and public power interests' position, repeatedly and strongly asserted over the course of the last several years, that Section 7 of the Colorado River Storage Project Act ("CRSP") requires the Bureau of Reclamation and WAPA to operate Glen Canyon Dam for maximum peaking power generation and that Section 7 of CRSP overrides all other purposes, uses, and values of the Colorado River. You may accuse me of 20-20 hindsight, but I can only tell this Subcommittee most emphatically that I, and I suspect most of my colleagues in the House of Representatives in 1956, never thought for a moment that Section 7 of the Colorado River Storage Project Act meant that Glen Canyon Dam had to be operated as a daily threat to the Grand Canyon.

Nevertheless, the primacy and priority of power generation has been the operative policy of the Bureau of Reclamation and WAPA. That policy has worked to the great detriment of the downstream resources in Glen Canyon National Recreation Area below the dam and Grand Canyon National Park. The Bureau of Reclamation and WAPA have resisted change. I am unpersuaded, and I hope that you are also, by the statements made by the Department of the Interior in testimony on Congressman Miller's legislation in the House of Representatives to the effect that legislation is not necessary because the Secretary of the Interior has ample authority under existing law to modify dam operations and protect the Grand Canyon. As an

academic proposition, I agree with that statement. However, the history of the long controversy over Glen Canyon Dam operations demonstrates that no Secretary of the Interior has chosen to exercise that authority. Congress should intervene, and Section 3 of the Grand Canyon National Park Protection Act puts the issue to rest.

I know from my own experience that agencies with different mandates—in this case the Bureau of Reclamation and the National Park Service and the Fish and Wildlife Service—frequently subject the Secretary of the Interior to pulling and hauling over decisions like the operation of Glen Canyon Dam. Sometimes, the Secretary of the Interior needs a little help . . . a little guidance . . . from Congress. In truth, Secretary Lujan should welcome this legislation.

Second, the Grand Canyon National Park Protection Act of 1990 confirms and reaffirms that the process provided for in the National Environmental Policy Act is the right process for determining how Glen Canyon Dam should be operated. Glen Canyon Dam operations represent exactly the kind of decision that Congress wanted Federal agencies to address under the National Environmental Policy Act. I commend Secretary Lujan for his decision last year to begin the preparation of an Environmental Impact Statement. However, given the long history of resistance to NEPA by the Bureau of Reclamation and WAPA I also strongly urge Congress to chart a clear course for the Secretary and set a deadline for completion of the Department of the Interior's Environmental Impact Statement.

More than a quarter of a century ago, I wrote in "The Quiet Crisis" that "Each generation has its own rendezvous with the land. . . . We can misuse the land and diminish the usefulness of resources, or we can create a world in which physical affluence and affluence of the spirit go hand in hand." I believe that Glen Canyon Dam represents such a rendezvous.

Glen Canyon Dam stands across the mighty Colorado River. The dam will store water and generate electricity. But because the hand of man now controls the flow of water through the dam and through the Grand Canyon, the Congress, acting for the American people, has a responsibility to ensure that our hand is guided firmly by the ethics of stewardship which, like all systems of ethics, require us to accept limits on our behavior. We must resist the arguments of those who, in Ansel Adams's words, "know the price of everything . . . and the value of nothing. . . . We must be guided by a keen and deliberate appreciation for the value of other forms of life on this planet and our power to harm and destroy them. Above all else, we must conserve and protect those unique resources and values that caused Congress to designate the Grand Canyon as a National Park and make its special qualities available to the American people for all time.

Thank you again for asking me to testify this morning. And I again commend you Senator Bradley, Senator DeConcini, and Senator McCain for your splendid leadership on this vital issue.

Senator BRADLEY. Thank you very much, Mr. Secretary. I would just like to ask one or two questions, if I could.

Senator Goldwater said if he had one vote that he could take back in his time here, it would have been the vote for the CRSP and the Glen Canyon Dam. How do you feel about it?

Mr. UDALL. Barry said that—

Senator BRADLEY. He said a lot of things.

[Laughter.]

Mr. UDALL [continuing]. Three years ago.

Well, the Udall brothers and Barry have a reservoir of affection that a lot of people have always not fully understood.

Barry Goldwater went to Wyoming as a young man. This was long before his political career. And he wanted to repeat Major Powell's trip. He went down from Green River. He took photographs. The first time as a young man that Barry Goldwater caught my attention was I think at a lecture where he was presenting his trip. So, he knew it.

And he shocked some Arizona people when he said that. When his Senate term ended, they asked him, Senator, is there any vote that you regret, and he said one.

And I remember now he was rather quiescent and quiet during this. He was a Senator. I was a young Congressman, and so on.

And I will save my own statement on that, Senator, if I can live long enough to maybe write my memoirs. But it was a painful decision then and it is a painful decision now.

But I think the question now is cannot we quickly achieve the kind of balance contemplated by this bill not interrupting the environmental impact process, but simply correcting this egregious mistake that is day by day impairing a great national park.

Senator BRADLEY. Do you think that fulfillment of the Secretary's obligation to the downstream environment—

Mr. UDALL. I think whoever is the Secretary of the Interior, one of his major functions is the carrying out of his responsibilities to protect against the impairment of the national parks.

Senator BRADLEY. Do you think that that could ever prevent the basin States from using their shares of the river under the Colorado River Compact?

Mr. UDALL. No. There is nothing that is in this legislation that impairs the water regimen, the water use contemplated. As a matter of fact, not production of hydroelectric power, the paramount reason for this project was water. And that dam is the regulatory dam that the upper basin wanted and needed. And I think Barry and I, if we have reservations about Glen Canyon Dam—we were in the lower basin, and this was not something that we needed for the lower basin. The upper basin needed it, and water control, water regulation of this big river was the paramount purpose, not hydropower.

Senator BRADLEY. Senator Wallop?

Senator WALLOP. If you were to be Secretary for a week and change the length of time of the EIS process, you would be Secretary for the next decade and a half while they kept you in court over the shortened—

[Laughter.]

Senator WALLOP. You could not get away with a week.

I mean, I am with you. It is frustrating how long these things take. But they take a long time in reaction to what the public has done with that particular tool.

Also, I would only say that however one may regret the fact that the dam was created, had it not been created, there would not now be any Central Arizona Project either. And some may like that idea too, but in fact all of us are living with decisions upon which the public counted.

I agree with you that there should be now no reason why water supply should be badly damaged by this piece of legislation. But one of the things that would be badly damaged by this is—and it may be that that is the choice we ultimately make, but we ought to make it at least with the sense that that is what is going to happen and what the consequences are—and that is power revenues would be substantially altered I think. And many of our States have some dependence on that as well.

Mr. UDALL. Well, Senator, again if I could be the Secretary for a week, I think the thing that I would find excruciating and compelling is the question that here is a dam over which the Secretary of the Interior still has substantial control. And here is his duty and

responsibility to protect a great national park. And faced with that, to simply let this regimen go forward, which was very single-minded in my opinion and wrong, to say the paramount purpose of this project is maximizing the revenues from hydropower and the way to maximize it is to use it as a peaking power instrument.

Peaking power has really come into the picture only when we had our electric power systems interconnected. While I was Secretary of the Interior, we restructured and rebuilt Grand Coolee Dam, the greatest hydroelectric facility, to be a peaking facility because suddenly we recognized the importance of peaking. We interconnected with the direct current line the Columbia River and California, San Francisco and Los Angeles, so that we could use the Columbia River in part as a peaking facility. But this did not exist in 1956. None of us knew or thought about peaking power. And I think it is distortion of the intent of Congress in 1956.

Senator WALLOP. Well, let me just observe—and I think you would agree—that had we not come across this interconnection, then there would have been a significant number more power plants built with other degradations to the environment simply by the necessity of having to supply the power that regions need. So, I am not talking so much about maximizing revenues on peaking power, but the fact of the interconnection has meant fewer power plants built in the west.

Mr. UDALL. Senator, with the kind of interconnections we have you could be much more efficient.

Senator WALLOP. I do not quarrel with that.

Mr. UDALL. Efficiency and conservation.

Senator WALLOP. Secretary Lujan believes that he has the authority to adjust the flows, and from your testimony, I gather you would agree with him.

Mr. UDALL. I think he could do it tomorrow if he wanted to.

Senator WALLOP. Thank you.

Senator BRADLEY. Thank you very much, Mr. Secretary. I appreciate your testimony and your thoughtfulness.

Our first panel consists of Dennis Underwood, Commissioner of the Bureau of Reclamation; James Ridenour, the Director of the National Park Service; and Michael Spear, the Regional Director of the U.S. Fish and Wildlife. Gentlemen, welcome to the subcommittee, and we are anxious to hear your testimony.

Mr. Underwood.

**STATEMENT OF DENNIS B. UNDERWOOD, COMMISSIONER,
BUREAU OF RECLAMATION, DEPARTMENT OF THE INTERIOR**

Mr. UNDERWOOD. Mr. Chairman, I am pleased to be here today. I am here to present the Department's position on S. 2807, and as the Department's representative, I am speaking on behalf of the Secretary.

What I would like to do is to highlight my written testimony, but I would like to request that that be included in the record.

Senator BRADLEY. Yes. Your full testimony will be included in the record.

Mr. UNDERWOOD. What I would like to do with your permission is to also add to a little bit of the background that has already been

discussed on the Colorado River system before I even highlight my testimony.

The Colorado River, if people are familiar with it, is a river that has an erratic nature. It generally has a flow that will vary from about 5 million acre-feet per year to a maximum of about 24 million acre-feet per year. That really led to the reason for the development of the 10 major reservoirs on the river system. That was to provide for a reliable supply. If you only have 5 million acre-feet, in trying to provide for the seven States' needs and Mexico, you would have a hard time providing for that.

The runoff or the supply of the Colorado River system extends from snow melt, and that basically is why you have had, in terms of the reservoirs, a change in the river's ecological systems, below those reservoirs because primarily it is a cold water, cold temperature system.

The 10 major reservoirs provide about 60 million acre-feet of storage. This is very critical to the Basin States. If you have watched, the last 4 years have been below normal runoff in the west and we are down now between about 15 million and 20 million acre-feet of that storage. Without that large amount of storage, we would be having some critical shortages in the basin States and also potentially in terms of meeting our commitments to Mexico. This year in particular, we are at about 45 percent of the average inflow into Lake Powell.

Water supply was not the only reason those dams were created, as others have testified. It was for river regulation and flood control. A tremendous amount of flood damage occurred on the lower Colorado River system. That really led to the development of Lake Mead.

Also, it was to improve navigation not only through the reservoirs themselves, but also in the stream channels since you had an erratic flow that potentially could go as high in the spring as 250,000 cubic feet per second and as low in the summer as less than 1,000 cubic feet per second. So, this provided for a more regulated flow in the system.

It also provided for hydroelectric generation. And this was an important part. If you look at all of the facilities, all of the power plants do have peaking capabilities. There are more generating units provided than required to meet the flows that are going to go through those systems to meet downstream water needs. Primarily that was designed to provide to meeting these energy needs. Energy need is not a flat need. It varies during the day. The hydroelectric plants were to help meet those needs. There is an efficient way to meet needs through hydroelectric energy.

Also, the power plants played a very important role in terms of funding the projects and also for the operation and maintenance.

The reservoirs also played a key part in terms of water quality. Initially it was for sedimentation problems, but in more recent times, the focus in terms of water quality has been in the salinity arena.

It also provided for fish and wildlife enhancement and recreation enhancement. Primarily at that time, though, if you will look at those beneficial uses, those were pointed at the reservoirs themselves. Little did we know at that time that a lot of those ecological

systems that we were creating really because of the cold water nature of those reservoirs below those dams, that we had an enhanced trout fishery, almost a blue ribbon trout fishery, below each of the Colorado River's major dams. In addition to that, you had a substantial amount of recreation that otherwise would not have occurred.

It also, though, had some tradeoffs. It had some tradeoffs in terms of impact on native species. Like I said, you changed from a warm, turbid water to cold, clear water.

Reservoir releases are governed by "The Law of the River." These are considered to be Federal laws, State laws, international treaties with Mexico, interstate compacts and court decrees. What governs the river regulation on a year-to-year basis, really, is the criteria for coordinated, long-term operations of the reservoirs. This was recognized that with the river's 10 major reservoirs, you did need a system for coordinated operation.

And this is where the Secretary has his authority, in terms of providing for all of the various types of uses. It requires the Secretary to administer the river to reflect the appropriate consideration of all uses of the reservoirs for all purposes, including flood control, river regulation, beneficial consumptive use, power production, water quality control, recreation, enhancement of fish and wildlife values, and other environmental factors.

And this is looking back in 1968 when we became more aware of the environmental needs that you referred to earlier. That is why in establishing the operating criteria—and these were done in cooperation with the Basin States—they considered all of these uses, not necessarily only traditional uses that you would see for the project purposes. They recognized that the river system did have to take into account the appropriate consideration for these other uses. In effect, the Secretary is the river master for the river system. He has to balance all of these uses, and he has to do it in accordance with The Law of the River.

Lake Powell, as we referred to, was authorized in 1956. Its principal purpose was to provide for the development of the Upper Basin River apportionments and also to meet the Colorado River Compact delivery obligations to the Lower Basin States. When Lake Powell was filling, from 1963 to 1980, basically all the excess flows went into storage. You had tributary sediment; inflow exceeded outflow from the canyon, and the storage of sediments occurred in the canyon. Basically you were establishing an equilibrium because you had a constant release over those years on an annual basis of 8,230,000 acre-feet a year.

What you did is you created a new river, like I indicated to you, from warm to cool water. You no longer had the heavy spring runoff that scoured the riverbanks. This allowed for new ecosystems to develop. You eliminated a lot of the annual flooding that allowed for a more diverse and extensive riparian and vegetation and wildlife community to colonize the high-water zone.

You also enhanced river rafting. From 1960 to 1972, the number of boaters grew from about 200 to over 16,000. If you take the whole 100-year period from 1870 to 1969, 1972 use alone exceeds all of that 100-year period.

You also provided for the wintering of bald eagles, and primarily that was because of the foraging base that they had for the spawning of trout.

But those new ecosystems did not come without conflicts. The National Park Service in 1989 completed a report on the management of the Grand Canyon. And they pointed out in that report that the recreational use along the Colorado River in the Grand Canyon is concentrated in the riparian zone and river beaches. Sudden rise in the use resulted in crowding and congestion, increased problems with accumulation of trash, charcoal, and human waste. Attraction sites were marred by multiple trails, trampled vegetation and also compacted soils.

In response to that, the Park Service developed a management plan which it finished in 1979. That plan even included the elimination of motorized craft on the river. Congress, in an amendment to the 1981 appropriations bill, prohibited the reduction of summer uses and in the passenger launches for commercial, motorized craft below the 1978 levels.

Also, like I indicated to you, the native species rely upon the backwaters. Those were eliminated basically when you had the cold water fisheries and actually provided for trout fisheries.

In terms of looking at some of the conflicts, I would just like to read one little passage from the National Park Service 1989 report because this indicates some of the conflicts that occur within this corridor. "The Management of the Upper Marble Canyon entails special considerations due to conflicting use and patterns in multiple jurisdictions. The use of the Colorado River shoreline in Upper Marble Canyon by fishermen has increased sharply in recent years. Sanitation and litter accumulation are worsening, and fishermen have been using beach camps also required by river runners. With major river camps destroyed by debris flows at Mile 18 and 19 and with the camps at 6 Mile Wash, Badger Creek, Soap Creek, Salt Water Wash and 13 mile camp often preempted by fishermen, few camps remain in the critical first day reach for non-commercial and commercial parties. Conflicts between fishermen and river running parties are expected to worsen in the near future."

The point of all of this, Mr. Chairman, in terms of pointing out some of these conflicts, is that there are limits to the magnitude and use that recreation and ecological and environmental resources established by the dams can evolve, just as there are limits to what can be developed in terms of a water supply and energy supplies.

The main focus of the debate is really on those recreational and ecological resources and environmental resources created by the dam, not damage really to the natural resources of the Grand Canyon. I think we should make a note, though, that there is also a need to protect the cultural resources of the Grand Canyon.

These uses must be appropriately balanced. Similar conflicts have and will develop in other projects. Similar resources are being created, in the same way that they have at Glen Canyon. We need factual information on those resources to arrive at appropriate, balanced and sound management decisions. These decisions must be based on scientific data and not in response to emotions.

This is the approach being taken by the Secretary with respect to the Glen Canyon studies. And I think that was one of his most significant actions in his first half year in office was the decision to prepare an Environmental Impact Statement on the operation of Glen Canyon Dam as to its impact on downstream environmental and ecological resources. The Secretary stated that the EIS would be prepared with full public review, and that EIS is now under way and is open to full public participation.

The studies in terms of the impact of operations on the Glen Canyon were initiated in 1982. There was a problem, though, because those initial studies from 1983 through 1986 basically took a period of time of unprecedented high flows, flows in the river exceeding 20 million acre-feet per year consecutively. Consequently, the studies found, not surprisingly, that flood control releases adversely impact downstream resources. Corrective action has already been implemented to reduce those flood probabilities from 1 in 4 years to 1 in 20 years under full reservoir conditions. That was done under the coordinated operating criteria in conjunction with the Basin States and the Bureau of Reclamation.

The Secretary recognized also that you needed to have data in terms of impacts under normal and less unusual conditions, and that is why he allowed for the second phase of the Glen Canyon environmental studies to go forward. A key component of that is the research flows that were initiated in 1990 and are scheduled to continue at least through July 1991. Those research flows will provide data to determine the impact under normal and less unusual conditions. We believe that it is premature to significantly alter planned operations until we have completed these research flows. This will also confirm the nature and extent of interim operating criteria that should be implemented and help us understand the impact of that interim operating criteria.

Imposition of interim flows at this time would interfere with the research. It would alter the baseline from which changes and impacts are measured. Modification to any portion of the research flows, such as imposition of interim flows, at the present time could also require overall adjustments to the research flow program to meet storage and water delivery needs.

Once we have this additional information in hand, we will be able to develop the interim power operating criteria, and the Secretary has directed within 90 days of completion of that research flows, that those interim flows be implemented. Those 90 days would allow us the ample opportunity to analyze a considerable amount of data that we have collected. Then interim flows will remain in effect until the EIS is completed. I think you also realize that the Secretary has extended the date needed to complete the EIS by about a year, and that was based on the information obtained from the public hearings, but also looking at the need for factual information and what it would take to accumulate and acquire that data.

Given the actions by the Secretary, we believe provisions of section 4 of S. 2807 relating to interim power operating criteria are unnecessary.

The current situation does not involve critical or emergency conditions, and orderly development and implementation of interim

flows at the conclusion of research flows is by far the more prudent option.

In summary, the Department believes the Secretary has the appropriate existing authority and discretion to establish interim flows and to protect the environmental and ecological resources of the Glen Canyon National Recreational Area and the Grand Canyon National Park. Therefore, the Department believes that the proposed legislation is not needed. Above and beyond all such considerations is the fact that we are committed to producing an EIS and eventual decision that will stand as a model to the responsiveness and openness and the integrity that it deserves in terms of reaching the appropriate balance of stewardship in terms of these important resources.

[The prepared statement of Mr. Underwood follows:]

PREPARED STATEMENT OF DENNIS B. UNDERWOOD, COMMISSIONER, BUREAU OF RECLAMATION, DEPARTMENT OF THE INTERIOR, ON S. 2807

Mr. Chairman, I am pleased to appear before you today and provide the Department's position on S. 2807 to establish and implement power operating criteria at Glen Canyon Dam and to protect the environmental and recreational resources of Grand Canyon National Park. As the Department's representative, I am speaking on behalf of the Secretary.

The Department of the Interior shares the interest of the Committee and others concerning operation of the Glen Canyon Dam and the Glen Canyon Dam Environmental Impact Statement process. One of the most significant actions by the Secretary in his first half year in office was to direct that an EIS be prepared on the effect of the operation of Glen Canyon Dam on the downstream environmental and ecological resources of the Glen Canyon National Recreational Area and Grand Canyon National Park. In making that decision, Secretary Lujan stated the EIS would be prepared in full public view, with participation by all interested parties. He further stated the Department would use the EIS to comply with statutory requirements for the operation of the dam while protecting downstream resources.

The EIS is under way and open to full public participation. Nearly 1,400 people have attended public scoping meetings in 7 locations. We heard from 400 speakers and we have received thousands of written comments.

It should be pointed out, however, that Federally supported research of this nature did not begin last year. In fact, through the Glen Canyon Environmental Studies, or GCES, significant research has been ongoing since 1982. This work originated from the uprating program for the generators at Glen Canyon Dam powerplant. The purpose of that program was to determine the effects of the operation of Glen Canyon Dam on the downstream environmental and ecological resources of the Glen Canyon National Recreation Area and Grand Canyon National Park. Over 40 individual research reports have been produced. One problem we encountered was that the initial research was conducted during the unprecedented high river flows of 1983-1986, thus affecting the range of data that could be collected. The Secretary directed that the GCES work continue to examine impacts under normal and less unusual conditions, and that the data developed be incorporated into the EIS.

The second phase of the GCES is now underway. A significant amount of current and future work to be done is dependent upon data from research flows from Glen Canyon Dam. These flows have been developed under the GCES program, analyzed by concerned and affected parties, and were initiated in June 1990 and are scheduled to continue at least through July of 1991. The public has been informed of the flow schedules and their purposes, as part of the EIS process.

The research flows are needed to determine the impact of Glen Canyon Dam operations on downstream environmental and ecological resources of the Glen Canyon National Recreational Area and the Grand Canyon National Park under normal and less unusual flow conditions of 1983-86 when the initial Glen Canyon Environmental Studies were conducted. We at the Department believe it is premature to significantly alter planned operations until after we have completed these research flows. The data we will collect from those flows will also be used to confirm the extent and nature of any interim power operating criteria that could be implemented, and to adequately understand the impacts of such interim criteria. At the same time, we are concerned that imposition of interim flows at this time would interfere

with the research, and would alter the baseline from which changes and impacts are to be measured. Modification to any portion of the research flows, such as imposition of interim flows, could also require overall adjustments to the research flow program to meet storage and water delivery obligations.

Once this additional data are in hand, however, we believe we will be in a position to develop interim power operating criteria for operation of Glen Canyon Dam, and Secretary Lujan has directed us to do so within 90 days of the completion of the research flows. At the same time, the Secretary has directed that any interim operating criteria will not interfere with the Department's obligations relating to the storage and delivery of water. The period of up to 90 days would provide time to analyze the considerable amount of data collected and to prepare recommendations of changes to existing power operations for interim purposes.

These interim flows will remain in effect until the EIS is complete and a final decision made regarding the long-term actions that will be taken. The interim power operating criteria will be based upon careful evaluation of all relevant research as well as potential impacts on river regulation, reservoir uses, existing power contracts, CRSP system repayment, and operating revenues.

The Secretary's decision to go forward with interim operating criteria following the research flow period is based upon the desire to act promptly to protect the resources of the Grand Canyon and the Glen Canyon National Recreation Area downstream from the dam. His decision is also based in part upon a determination on the part of Reclamation that he need to extend the completion date of the Glen Canyon EIS, until early 1993, which represents a 1-year extension of time. This reflects the additional time required to acquire necessary factual data as determined in the public and technical scoping process for the EIS and the second phase of the GCES. Given these actions by the Secretary, we believe the provisions of Section 4 of S. 2807 relating to interim power operating criteria are unnecessary.

The current situation does not involve critical or emergency conditions and the orderly development and implementation of interim flows at the conclusion of the research flows is by far the prudent option.

The Department does not support the position requiring only the use of non-reimbursable. Congressionally appropriated funds for the Environmental Impact statement. We believe the use of power revenues was and continues to be an appropriate source of funding for studies associated with determining future power plant operations. The source of long term funding for monitoring needs to be addressed in the legislation.

In summary, the Department believes the Secretary has the appropriate existing authority and discretion to establish interim flows and to protect the environmental and ecological resources of the Glen Canyon National Recreation Area and Grand Canyon National Park. Therefore, the Department believes that the proposed legislation is not needed. Above and beyond all such considerations is the fact that we are committed to producing an EIS and eventual decision that will stand as a model of responsiveness, openness and integrity.

Mr. Chairman. I would be pleased to answer any questions Members of the Committee may have.

Senator BRADLEY. Thank you very much, Mr. Underwood.

Let us go to Mr. Ridenour now. I would like you, if you could, to limit your testimony to 10 minutes, and then to Mr. Spear. And then we will ask questions of the panel.

STATEMENT OF JAMES M. RIDENOUR, DIRECTOR, NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR

Mr. RIDENOUR. We are in substantial agreement with the Bureau of Reclamation that sufficient discretion rests with the Secretary to undertake measures to minimize harm to the resources affected by the operation of Glen Canyon Dam at Page, Arizona, and that as a result, S. 2807 is not necessary.

The ongoing and potential damages to Grand Canyon National Park and Grand Canyon National Recreation Area resulting from widely fluctuating discharges from Lake Powell are of great concern to the National Park Service. Because of that concern, we have been participating in the Glen Canyon environmental studies

process, and more recently have become involved as a cooperating agency in the development of the environmental impact statement currently under way on the effects of the operation of Glen Canyon Dam. We are encouraged by the indications by the Bureau of Reclamation to provide for research flows and to administratively provide for interim flows in order to mitigate damage to the resources of Glen Canyon National Recreation Area and Grand Canyon National Park during the preparation of the EIS.

We are concerned that section 3 of the bill, while well intended, does not provide for the more complete consideration of environmental values available to the Secretary under the provisions of the operating criteria established under section 602(a) of Public Law 90-537. Those criteria are not limited to the enhancement of natural resources as S. 2807 would provide, but include recreation, enhancement of fish and wildlife values and other environmental factors. These other environmental factors would include cultural resources, which the bill does not speak to.

Section 5 of S. 2807, while formally establishing the additional time for completion of the EIS, does not substantively add additional considerations beyond those that would normally be taken into account for the NEPA process. As a result, we do not believe its provisions are essential to the completion of the EIS on the operation of Glen Canyon Dam.

In summary, while the goals of S. 2807 are to provide for additional protection for the resources of Glen Canyon National Recreation Area and the Grand Canyon National Park, we believe that in addition to the authority already vested in the Secretary, sufficient legislative direction and administrative discretion already exist for him to provide for both research and interim flows during the preparation of the EIS and to operate the Glen Canyon Dam so as to mitigate and not further degrade the resources held in trust by the Secretary in the affected units of the National Park System.

Thank you, sir.

[The prepared statement of Mr. Ridenour follows:]

PREPARED STATEMENT OF JAMES M. RIDENOUR, DIRECTOR, NATIONAL PARK SERVICE,
DEPARTMENT OF THE INTERIOR, ON S. 2807

Good morning, Mr. Chairman. I am pleased to present the views of the National Park Service regarding S. 2807. We are in substantial agreement with the Bureau of Reclamation that sufficient discretion rests with the Secretary to undertake measures to minimize harm to the resources affected by the operation of the Glen Canyon Dam at Page, Arizona, and that as a result, S. 2807 is not necessary at this time.

The on-going and potential damages to Grand Canyon National Park and Glen Canyon National Recreation Area resulting from widely fluctuating discharges from Lake Powell are of great concern to the National Park Service. Because of that concern, we have been participating in the Glen Canyon Environmental Studies (GCES) process, and, more recently, have become involved as a cooperating agency in the development of the environmental impact statement (EIS) currently underway on the effects of the operation of the Glen Canyon Dam. We are encouraged by the indications of the Bureau of Reclamation to provide for research flows and to administratively provide for interim flows in order to mitigate damage to the resources of Glen Canyon National Recreation Area and Canyon National Park during the preparation of this EIS.

At the same time, we are concerned that the provisions of section 4 of S. 2807 may unnecessarily divert resources from the timely completion of the Glen Canyon EIS and further delay any potential permanent modifications to the operating regime of the Glen Canyon Dam.

In like fashion, we are further concerned that section 3 of the bill, while well intended, does not provide for the more complete consideration of environmental values available to the Secretary under the provisions of the operating criteria established under section 602(a) of Public Law 90-537. Those criteria are not limited to enhancement of natural resources as S. 2807 would provide but include recreation, enhancement of fish and wildlife values, and other environmental factors. These other environmental factors would include cultural resource, which the bill neglects.

Section 5 of S. 2807, while formally establishing the additional time for completion of the EIS, does not substantively add additional considerations beyond those that would normally be taken into account through the NEPA process. As a result, we do not believe its provisions are essential to the completion of the EIS on the operation of the Glen Canyon Dam.

In summary, while the goals of S. 2807 are to provide for additional protection for the resources of Glen Canyon National Recreation Area and Grand Canyon National Park, we believe that, in addition to the authority already vested in the Secretary, sufficient legislative direction and administrative discretion already exist for the him to provide for both research and interim flows during the preparation of the EIS and to operate the Glen Canyon Dam so as to mitigate and not further degrade the resources held in trust by the Secretary in the effected units of the National Park System.

Senator BRADLEY. Thank you very much, Mr. Ridenour.
Mr. Spear.

**STATEMENT OF MICHAEL SPEAR, REGIONAL DIRECTOR, U.S.
FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR**

Mr. SPEAR. Mr. Chairman, I am substituting for Director John Turner today who is on a well-deserved leave in Wyoming. And I assure you he would like to be here because he has lived his life in the shadow of the Tetons and Yellowstone and appreciates the richness of our great national parks.

The Service supports the issuance of interim operating criteria as required by S. 2807. However, we recommend that the interim operating criteria be established administratively.

The Service believes that any interim operating criteria should provide sufficient flows to protect fishery resources. While long-term flow levels will be established as a result of further analysis, preliminary estimates indicate that approximately 8,000 cfs may be necessary between December and March of each year for trout reproduction. We also hope an interim flow regime can become effective as soon as possible, but no later than 90 days from the conclusion of the research flows and continue until the final EIS is completed and a decision is made by the Secretary.

The segment of the Colorado River addressed by S. 2807 once provided habitat for eight endemic fish species, including the endangered Colorado squawfish, bonytail chub, humpback chub, and the razorback sucker, a species now proposed for listing as endangered.

Since construction of the dam, two species endemic to this river have been extirpated from the canyon area. They are the Colorado squawfish and the bonytail chub. Captures of the razorback sucker are now very rare, a condition which has increased our concern for this species.

The humpback chub continues to inhabit this river segment. However, reproduction of this species is now confined to the lower 9 miles of the Little Colorado River. Water temperatures in the Colorado River are generally unsuitable for spawning of the hump-

back, but they continue to use it as rearing habitat. During the earlier Glen Canyon environmental studies, consideration was given to measures which could increase water temperature to permit spawning. However, based on available data, this action is not recommended at this time. Striped bass have been recorded at the mouth of the Little Colorado River, but are more prevalent below Havasu Creek, approximately 180 miles below Glen Canyon Dam. Increased temperatures could allow this highly predacious species to move upstream to prey on the humpback chub.

The recovery plan for the humpback chub currently under revision calls for five viable, self-sustaining populations in order to down-list the species. The Grand Canyon population is recognized as one of the five necessary populations and is the species' foremost stronghold. Key to the preservation of this population is establishment of a coordinated interagency protection plan for the Little Colorado River.

Other endangered species of concern are the bald eagle and the peregrine falcon. Wintering bald eagles have recently been documented foraging primarily on trout in a tributary confluence with the mainstream. They may also utilize the numerous waterfowl migrating through or over-wintering in the canyon. The Grand Canyon supports what is most likely to be the largest breeding population of peregrine falcons in the lower 48 States. While we know peregrines forage on swifts and swallows, we need to determine the prey species relationship to aquatic and riparian insects, and insect production in relation to the releases from Glen Canyon Dam. Assurance of forage availability for this excellent population of peregrines would be helpful in recovery efforts to down-list these species.

The cold, clear waters from Glen Canyon Dam have produced the best trout fishery in Arizona. Not only are the fish often of trophy size, they come from rushing cold waters bordered by red canyon walls and blue western skies. The Arizona Game and Fish Department has designated the Lee's Ferry reach as a blue ribbon fishery, and last year's participation was estimated at over 35,000 angler days.

The Service has stewardship responsibilities for our Nation's fishery resources, and we reinforce the value Arizona Game and Fish Department has placed on this resource. The National Recreational Fisheries Policy, signed by then Vice President Bush in 1988, identifies the significant social and economic benefits related to recreational fisheries.

The Fish and Wildlife Coordination Act is the primary means for the Service working closely with the State fish and wildlife agencies and others to provide recommendations to the Bureau of Reclamation and the Secretary of the Interior to ensure that water development projects are planned and implemented with full and equal consideration for the protection, mitigation and enhancement of fish and wildlife resources.

One other act that obviously comes into play is the Endangered Species Act. The Service will prepare a biological opinion based on the research information. The opinion will be timed to meet the EIS schedule.

Mr. Chairman, thank you again for the opportunity to testify. I will be pleased to respond to questions.

[The prepared statement of Mr. Spear follows:]

PREPARED STATEMENT OF MICHAEL SPEAR, REGIONAL DIRECTOR, FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR, ON S. 2807

Mr. Chairman, I appreciate this opportunity to discuss the value of fish and wildlife resources of the Colorado River that are affected by the operation of Glen Canyon Dam, and to comment on S. 2807, to establish interim operational criteria.

The Southwest Region of the Fish and Wildlife Service provides the Federal leadership to conserve, protect, and enhance fish and wildlife resources in that area. Of special responsibility to us are endangered and threatened species, fishery resources, migratory birds, and the protection of fish and wildlife habitats.

The Service, in its leadership role, has historically and continually based its management on scientific studies. We support the issuance of interim operating criteria as required by S. 2807; however we recommend that the interim operating criteria be established administratively—as soon as possible, but no later than 90 days after the research studies are completed. We recognize that the long-term operating plan for the dam will be based on the EIS and environmental studies currently underway.

The Service supports the need to examine alternatives to the current flows at Glen Canyon Dam. The dam has greatly altered the hydrology of this segment of the Colorado River, changing normal flow patterns, reducing water temperatures, and removing sediment. The cold, clear waters from Glen Canyon Dam have produced the best trout fishery in Arizona in the Lee's Ferry reach. However, these changes have also had adverse impacts on certain fishery resources, including what are now threatened and endangered species.

We also support the ongoing efforts to complete the environmental impact statement (EIS) initiated by Secretary Lujan last year, together with the related research studies which commenced last month.

The Service believes that any interim operating criteria should provide sufficient flows to protect fishery resources. While long-term flow levels will be established as a result of further analysis, preliminary estimates indicate that approximately 8,000 cubic feet per second (cfs) may be necessary between December and March of each year for trout production. We also hope an interim flow regime can become effective as soon as possible, but no later than 90 days from the conclusion of the studies, and continue until the final EIS is completed and a decision is made by the Secretary.

The principal directive in S. 2807 is to establish a process for the Secretary of the Interior to determine if adequate information exists to establish interim flows for the dam. In addition, a timetable would be established during which this determination would be made and the criteria would become operational. Under the provisions of section 4, the timetable for implementing operating criteria would be variable, ranging from as early as within 30 days of enactment of the bill, to as late as September 1, 1991. The specific time frame for establishing interim flows is contingent on a finding by the Secretary that adequate information exists to establish interim flows.

The Service's concerns are based on our stewardship role for fish and wildlife resources. The segment of the Colorado River addressed by S. 2807 once provided habitat for eight endemic fish species, including the endangered Colorado squawfish, bonytail chub, humpback chub, and the razorback sucker, a species proposed for listing as endangered.

Prior to construction of the dam, river flows fluctuated seasonally ranging from a high of 250,000 cfs, to an extreme low of 750 cfs. The river now fluctuates on a daily or hourly basis to meet power demands. Current criteria provide for a range from a high of 31,000 cfs, to a low of 3,000 cfs during the summer and 1,000 cfs in the winter. However, the actual range of fluctuation (minimum and maximum) within any one month is dependent upon the monthly water release volume. Higher flow can occur during periods of high reservoir levels and excessive runoff.

Since construction of the dam, three species endemic to this river reach have been extirpated from the canyon area. Extirpated species include the endangered Colorado squawfish and bonytail chub. Captures of the razorback sucker are very rare, a condition which has increased our concern for this species.

The humpback chub continues to inhabit this river segment. However, reproduction of this species is now confined to the lower nine miles of the Little Colorado River. Water temperatures in the Colorado River are generally unsuitable for spawning of the humpback, but they continue to use it as rearing habitat. During

the earlier Glen Canyon environmental studies, consideration was given to measures which could increase water temperatures to permit spawning; however, based on available data, this action is not recommended at this time. Striped bass have been recorded at the mouth of the Little Colorado River, but are more prevalent below Havasu Creek, approximately 180 miles below Glen Canyon Dam. Increased temperatures could allow this highly predacious species to move up stream to prey on the humpback chub.

The recovery plan for the humpback chub, currently under revision, calls for five viable, self-sustaining populations in order to downlist the species. The Grand Canyon chub population is recognized as one of the five necessary populations and is the species' foremost stronghold. Key to preservation of this population is establishment of a coordinated interagency protection plan for the Little Colorado River.

Other endangered species of concern are the bald eagle and the peregrine falcon. Wintering bald eagles have recently been documented foraging primarily on trout in a tributary confluence with the mainstream. They may also utilize the numerous waterfowl migrating through or overwintering in the Canyon. The Grand Canyon supports what is most likely to be the largest breeding population of peregrine falcons in the lower 48 states. While we know peregrines forage on swifts and swallows, we need to determine the prey species relationship to aquatic and riparian insects, and insect production in relation to releases from Glen Canyon Dam. Assurance of forage availability for this excellent population of peregrines would be helpful in recovery efforts to downlist this species.

The cold, clear waters from Glen Canyon Dam have produced the best trout fishery in Arizona. Not only are the fish often of trophy size, they come from rushing cold waters bordered by red canyon walls and blue western skies. The Arizona Game and Fish Department has designated the Lee's Ferry reach as a "Blue Ribbon Fishery" and last year's participation was estimated at over 35,000 angler days.

The Service has stewardship responsibilities for the Nation's fishery resources, and we reinforce the value Arizona Game and Fish Department has placed on this resource. The National Recreational Fisheries Policy, signed by then Vice President Bush in 1988, identifies the significant social and economic benefits related to recreational fisheries. It recognizes that healthy fish populations depend on productive habitats and scientific management based on research. The policy also calls for concerted efforts to preserve, restore, and improve habitats, and protect our heritage of native species and natural ecosystems.

The Fish and Wildlife Coordination Act is the primary means for the Service, working closely with the State fish and wildlife agencies and others, to provide recommendations to the Bureau of Reclamation and the Secretary of the Interior to ensure that water development projects are planned and implemented with full and equal consideration for the protection, mitigation, and enhancement of fish and wildlife resources. These recommendations are extremely important to the National Environmental Policy Act process and other Reclamation planning processes.

Mr. Chairman, thank you again for the opportunity to testify. I will be pleased to respond to questions.

Senator BRADLEY. Thank you very much, Mr. Spear.

Mr. Underwood, as I hear your testimony, basically you are asking us to trust you to do the right thing here. What might you say to anyone who was a skeptic and said, well, I do not know if we really can trust the Bureau to do the right thing here? How could you reassure people?

Mr. UNDERWOOD. I think in this particular case, Mr. Chairman, looking at the open participation in this process, looking at the technical teams that we have, not only from the economics field, but from the environmental field, and the amount of active participation that is going on I think there is the necessary check and balance. In the case when we were trying to do the EIS in a timely manner, we got a public outcry that we were trying to hurry things up. Then if you try to look and do it in a responsible fashion, you are told that you are elongating it. So, I think you have those checks and balances. I think the amount of diversity of the people who are participating in the process will not let us go very far astray.

I think the other part that is key is when the information is developed—like I indicated to you, the dam that we are looking at actually created a new ecological system. We are now just trying to find out the information as to how they exist and what levels should they evolve to. So, this is not something that you could base on past experience. These are ecological systems that are relatively new in terms of the Grand Canyon. It will be instrumental in helping us in some other areas. We have other facilities with similar issues that are being raised. This process I think will help us go through in looking for the appropriate balance and also give the public the reassurance that we are acting in a responsible manner.

Senator BRADLEY. In your testimony, you seem to argue that interim flows could hurt the scientific studies now under way in the canyon, and that was the same position that you took in the House.

Mr. UNDERWOOD. Yes.

Senator BRADLEY. I notice that after you, came Dr. Patten who is the chief scientist overseeing the studies, and he was quoted as saying, "The interim flows would not only help protect the canyon, but would not have much of an impact on the studies." Should we believe you or the chief scientist?

Mr. UNDERWOOD. First of all, we were the ones who hired this independent scientist, which is good. I think this gives it some credibility.

Senator BRADLEY. He is independent. That is for sure.

Mr. UNDERWOOD. Yes.

And in the particular case of allowing him to state his opinion—and I have not bothered with that at all, and let me tell you why. If you look at the legislation, we are to comply with the delivery requirements of the Colorado River compact. Here you have a certain amount of water, a set volume of water, that has to be released on a yearly basis. In one of the directives that I set, I said I wanted to make sure that every research flow was absolutely needed because of the potential impact they may have on other uses.

If you go back now, again remembering that you have the area under the curve as the total amount of water that you are dealing with, if you start moving around with the minimums or maximums, you basically are going to distort the whole research plan. You go back to square one potentially and start redoing the research flows all over, which will just lead to further delays. Granted, you could do some refinements in terms of research, but when you have to comply with the compact delivery requirements, there is an additional factor which the senior scientist does not necessarily take into account.

Senator BRADLEY. So, you say you cannot do both.

Mr. UNDERWOOD. Pardon me?

Senator BRADLEY. You say you cannot do both.

Mr. UNDERWOOD. That is right. If you start changing some of those research flows, you are going to have offsetting or potentially you have to redo the whole period of research flows, which you could do. But, if they were so necessary to begin with, which is what I said that I wanted to ensure, then why would we be so willing to change it this time? And again, it would lead to a situation

where we would have to then design another research packet, which would just add to further delays.

Senator BRADLEY. In your testimony it states that "The Secretary plans to impose interim flows not later than 90 days after concluding the research flows in July of 1991." In S. 2807, we basically say 30 days after cessation of the research flows or September 1, 1991. It seems to me like we are 1 month apart here. What is the problem?

Mr. UNDERWOOD. I think in this particular case, it is when you actually institute them.

And the other part is if you are asking about looking at if you have adequate information now, again trying to do this in a very timely manner I think is critical. What you are really asking for, when you look at the bill, is some additional work to be done, which would then just compound the problem. If, in fact, our research is really needed, what is wrong with those research flows actually representing interim flows during this period of time? What is wrong with that if, in fact, that is what is needed to provide for the information needed to define the impacts?

What we are saying is once we have that information, then we can look at what would be good because we are elongating at the request of people and because we recognize that there is a factual amount of information that needs to be provided. We elongated the EIS process, and we know that that is going to take a longer period of time, going to early 1993. Then we would have interim flows because there is going to be a period of time that we would be concerned from the information that we learned from the research.

Senator BRADLEY. When you are doing the EIS, what kind of scientific information do you think you will be unable to get?

Mr. UNDERWOOD. Probably satisfying senior scientists. What you are really looking at is in this particular case you are getting a very small period of time. People could say if you really want scientific, valid information, you should do this for 20 years to get the data that you need because you are taking a relatively short period of time.

The other thing that I think is interesting is that you remember that we had an equilibrium established from 1963 to 1980 in the canyon because you had all of the excess water going into storage. So, basically you had an opportunity for the riparian habitat and also the flow fluctuations to more or less stabilize. Then along came 1983 through 1986, where we just wiped out everything because you went back to the normal dynamic situation of a river, and it obviously adversely affected the riparian habitat.

You are now going through a period of time following 4 years of below-normal runoff. You are now going back through a transition period of time. Is that really representative of what it is going to be in the long term? In other words, you are now going through a dynamic situation in terms of beach dynamics or sediment dynamics. That is always ongoing, but you are going through a period of trying to establish another equilibrium right now. So, it would probably be that it may not be representative of something long term.

However, that should not distract from getting adequate operating criteria. It would distort maybe if you wanted the complete answers to all the science.

Senator BRADLEY. So, you are saying it might be a snapshot, but it will be a partial snapshot.

Mr. UNDERWOOD. I think it is the snapshot that is needed to potentially define the impacts that we are talking about.

Senator BRADLEY. What about any doubts about getting operational conditions evaluated? Do you have any concerns that you will not be able to get operational conditions—

Mr. UNDERWOOD. No. Looking at the interim flows, they are ranging again between 1,000 cubic feet per second all the way up to really the peaking capability of the plant, or the maximum of the plant, which is in excess of 30,000 cubic feet per second. So, you are getting the span that you need.

You are also looking at the ramping, in other words, the buildup. And in many cases, the research flows are actually going up and down at a greater rate and a lesser rate than what would normally occur. So, you are trying to get points on the curve, so to speak.

Senator BRADLEY. So, you think in terms of minimum, fluctuating, high. You cover all—

Mr. UNDERWOOD. That is right. Those are the ones we do not have. You have to remember 1983 through 1986 the plant was base-loaded. You had 30,000 cubic feet per second just going through there. You were just trying to keep that down, trying to keep those flows at that time. You did not get the fluctuating flows or the ramping or the impacts of ramping at that time. You did not collect data at that time.

Senator BRADLEY. Would another 2 years on the EIS make a difference?

Mr. UNDERWOOD. Do you mean adding to what I have already talked about?

Senator BRADLEY. Yes.

Mr. UNDERWOOD. I do not think in terms of looking at the operating criteria and—I think that we may find some deficits in information. We are looking at, like this bill addresses, long-term monitoring because you are still going to learn. That is not going to be the final answer. You may learn the dynamics of what is going on. So, that is going to help.

But I think in terms of looking at the appropriate balance, again these resources we are talking about did not have data before. Where do you get the data in terms of recreation or some of the fish and wildlife concerns? A lot of that is recent vintage, again remembering that this ecosystem has only been in existence since 1963.

Senator BRADLEY. What is the Bureau's commitment in terms of dollars for the EIS and in terms of personnel?

Mr. UNDERWOOD. Let me address the personnel first of all. I consider this, along with the Secretary, probably one of the most important EIS's that we are doing, again not so much just because it is related to the Grand Canyon, but because it will also give us insight as to what type of appropriate balancing we need to do at other facilities. So, I have dedicated myself to the fact that we will use whatever talent we need. This effort is being run out of our

Upper Colorado Region, but I have offered for their disposal our capabilities out of the Denver office and even in other regions, if necessary.

In terms of dollars, it does not come cheap. In 1990 we are talking about spending potentially on the studies about \$5 million; in 1991 about \$7 million; in 1992 about \$2 million. We also spent through the period for the initial phase of the Glen Canyon environmental studies about \$7 million. So, you are talking in the neighborhood of \$21 million in terms of providing the data that you are utilizing to come to an appropriate balance of resources.

Senator BRADLEY. Can you be any more precise on personnel? I know you are going to use the other offices, but how many people will actually be—

Mr. UNDERWOOD. I can provide it to the committee. We have, like I indicated—

Senator BRADLEY. Give me a ball park now.

Mr. UNDERWOOD. Let me tell you one of the things that concerned me—this is my life before, coming from a State perspective—was the management of the studies. We have now appointed one at the high elevation. The Regional Director has taken his responsibilities. The principal person below that is Assistant Regional Director. We have a new Program Manager to make sure that people are being accountable for getting things done on time. We are now much more into the management of the program, in terms of critical paths, making sure that the effort is going to be done in a timely manner. So, I can make available to you the number of staff that we have dedicated to this effort. I would be more than happy to.

Senator BRADLEY. I would appreciate that, if you could, for the record.

[The information referred to follows:]

Reclamation is committing a significant number of staff directly to the subject efforts. The organizational structure for the line authority of the work begins with the Commissioner of Reclamation and is delegated to the Regional Director and his staff in Salt Lake City. In charge of the effort for the Regional Director is the Assistant Regional Director, with the assistance of the Program Manager of the Colorado Rivers Studies Office and a staff of thirteen people. That staff consists of Glen Canyon Environmental Studies group including a Study Manager, a Hydrologist, a Biologist, and Environmental studies Coordinator, a Support Services Supervisor, and two clerk-typists as well as Glen Canyon Dam Environmental Impact Statement group including a Manager, a Biologist, a Public Involvement Specialist, an Administrative Coordinator, plus a Secretary and a Coordination Specialist. Reclamation also has eight members on the interagency EIS Writing Team and will have a number of staff involved in the review and production of the subject documents. In addition, Reclamation is utilizing other employees to accomplish research in the Grand Canyon as well as other researchers from other agencies and organizations which brings the total researchers to over 140.

Senator BRADLEY. Could you tell us how will this EIS be tied together with the WAPA power marketing EIS?

Mr. UNDERWOOD. I will attempt to. Let us put it that way I guess.

Again, there are two different focuses. One is the EIS we are talking about here to measure impact on downstream resources from a project operation. We are talking about the impact on a national recreational area and park, whereas the EIS that is being done in terms of the WAPA program is really on the marketing of

power and not necessarily in terms of looking at the impact on particular recreational and ecological environmental resources. I guess that is probably as brief as I could be and try to explain the difference.

Senator BRADLEY. So, you do not see the WAPA study as a subset of the overall Reclamation study?

Mr. UNDERWOOD. Well, I see the interchange of information, obviously, and the people that are involved from Western Area Power Administration are participating in our team. Obviously, the data and information that we gain will be of benefit, and because this potentially will affect power operations, then obviously, there is that integration because you may be losing certain types of capacity.

Senator BRADLEY. Do you think that environmental laws are part of the law of the river?

Mr. UNDERWOOD. Oh, without a doubt.

Senator BRADLEY. In terms of precedence, what do you think?

Mr. UNDERWOOD. Pardon me?

Senator BRADLEY. Which laws supersede any conflicting provision in earlier law? For example, the Endangered Species Act versus the compact—

Mr. UNDERWOOD. You are not being easy today, are you?

[Laughter.]

Mr. UNDERWOOD. First of all, you have to consider what the river is being operated for. And again, looking at various resources that you are trying to protect, you are coming up with a balance. If, in fact, you have like the endangered species, obviously, we know what is going to take precedence in those cases.

Senator BRADLEY. Which?

Mr. UNDERWOOD. The endangered species. If you look at what is being done in terms of the Colorado River program, there is an endangered species recovery program.

One thing to remember in the Grand Canyon and the Glen Canyon, though, is that you cannot have both in this particular case. You have cold water. If you warm up the water, then the trout do not survive. If you warm it up too much, then your striped bass either eat the endangered species or eat the trout. It is as simple as that. The trout were in Lake Mead. They are no longer there because striped bass ate them.

Senator BRADLEY. So, the bass are the badest.

[Laughter.]

Mr. UNDERWOOD. Those are some of the decisions, though—we make decisions regarding project development, but do we look at the same decisions that we may have made in the same manner? We were going by the seat of the pants when you introduce species. People wanted sport species, but is it right? Should we have introduced the striped bass? You cannot go back in hindsight now, but you should ask yourself some of those questions. Are you looking for a trophy size fishery, or are you looking for a healthy fishery? Those are two different types of fisheries. And the same thing with the species that you have now. Should it be warm water species; should it be cold water species?

Again, we were catering to the public in terms of trying to satisfy fishing need without necessarily looking at the consequences of

our actions. What we are doing now is looking at the consequences of our actions and trying to arrive at an appropriate balance. That same type of scrutiny should be directed toward these type of resources when we make these decisions also.

Senator BRADLEY. Let me ask Mr. Ridenour what kind of things do you think that the NEPA analysis should consider to try to remedy the adverse impacts of the dam's operations on the park?

Mr. RIDENOUR. Well, certainly, the areas that are essential for the camping operations along the sides. We have about 17,000 people going through in terms of river rafting.

Senator BRADLEY. Do they adversely impact the environment?

Mr. RIDENOUR. Do the—

Senator BRADLEY. The recreational users of the river?

Mr. RIDENOUR. Well, to some extent they do. We try to, obviously, minimize those.

Senator BRADLEY. How? How do they impact the environment and how do you try to minimize those impacts?

Mr. RIDENOUR. Well, for example, everything from hauling out all trash, being very, very careful in terms of what we do with vegetation along the way in terms of impacting the vegetation from camping facilities, for example, hauling out waste. We try to take every precaution we can to protect that environment.

I think this question of the fisheries is really a fascinating question, having been a fisheries administrator at one time, because I am sure that there is tremendous conflict in terms of what people think should be done in terms of that fishery. Those fellows who like the fly rods and the cold water fish and the trout are not going to give up that kind of an idea easily. Yet, in adhering to the Endangered Species Act, it is going to be difficult to keep that going. So, I certainly think that is an area that as the Park Service, we are kind of muddling through, as far as I am concerned, because we like both aspects.

Senator BRADLEY. The public power community seems to be interested in focusing a debate on the steps that the Secretary could take that do not involve power system operations. And I have a couple questions that flow from that.

Do you think that the Glen Canyon EIS will turn into a surrogate park management planning effort?

Mr. RIDENOUR. Well, it will have to. It will have to have an impact on it. We hope that in the continuing EIS process, that we are going to be very deeply involved on a day-to-day basis with our people. Our superintendent I believe is our official representative to the EIS process. I think it could have potential impacts and probably will have, and they are ones that we hope we can live with.

Senator BRADLEY. Are there non-power source options—non-power source options—that the Secretary should not consider in this EIS?

Mr. RIDENOUR. I guess I am not with you, Mr. Chairman.

Senator BRADLEY. Non-power system options, in other words, options that do not relate particularly to management of the dam for purpose of peaking or flows through the dam.

Mr. RIDENOUR. Well, if I get the drift of your question, to my mind comes ramping, for example. Ramping is a system that is re-

lated to power, but if you were not working with the power option, ramping would not be such a problem, and ramping is a problem for us. So, that is certainly one. It is the rapid change. It is much a problem many times as just change.

Senator BRADLEY. Let me ask you. Does the Park Service derive revenues from recreational users of the river?

Mr. RIDENOUR. Yes.

Senator BRADLEY. How much?

Mr. RIDENOUR. Well, I was just trying to figure before we came up about what that would reasonably be. But there are about 17,000 people who annually use the river for river trips. We were trying to make some quick calculations, and it was very, very difficult to do because some of them are 3-day trips and some of them are longer than that. I just fiddled around on the back of the paper, and I have no idea whether I am in the ball park. But I came out with a little over \$1 million a year, like \$1.1 million.

Senator BRADLEY. A million a year? Do they go to the park budget?

Mr. RIDENOUR. No, sir.

Senator BRADLEY. They come back into the pool?

Mr. RIDENOUR. Yes, sir.

We can provide you exact figures for the record, sir.

Senator BRADLEY. Okay. I would like if you could do that.

[The information referred to follows:]

In 1988 the National Park Service collected approximately \$312,300 in franchise fees from river running concessions within Grand Canyon National Park, Arizona.

The National Park Service does not track the monies that users of these river running concessions spend elsewhere in Grand Canyon National Park, nor do we assume that the concessioners collect such information. For example, some users of the river float from Lees Ferry within Glen Canyon National Recreation Area to Phantom Ranch in Grand Canyon National Park. Some of these visitors then take advantage of concession-owned mules to travel to the South Rim where they undoubtedly spend unknown sums of money. The mule operators do not differentiate between those who arrived at Phantom Ranch by foot and those who came via the river. Similarly, concessioners at the Rim Village do not differentiate among the various types of visitors at their facilities. Suffice it to say that some unknown additional monies are spent within the park by visitors who utilize river running concessions.

Senator BRADLEY. Tell me. Do those people who use the river recreationally patronize the businesses and concessions of the park?

Mr. RIDENOUR. Yes, sir. They often do.

Senator BRADLEY. What is the worth of that annually?

Mr. RIDENOUR. And that is one we will get back to you as well.

Senator BRADLEY. That is in addition to the \$1 million?

Mr. RIDENOUR. Yes. What I was calculating was trying to figure out just what the cost of taking the trips themselves were.

Senator BRADLEY. Do you think that if we are aiming to beach erosion, that one of the things that should be considered is cutting back on recreational uses?

Mr. RIDENOUR. I do not believe at this point that the recreational uses have become a problem to the point that we would need to cut them back. We do have a waiting list, so to speak, that is created for private uses, and sometimes that takes quite a few years, as do other agencies, the Forest Service, the BLM, to get on the river. But I do not think that that is a significant problem for us right now.

Senator BRADLEY. Mr. Spear, does recreational use in any way threaten endangered species?

Mr. SPEAR. Mr. Chairman, I am not aware of any significant conflict between recreational use and the endangered fish or the endangered species.

Senator BRADLEY. Is there anything that the NEPA consideration and analysis should consider relating to endangered species?

Mr. SPEAR. Well, there is a rather complete study plan, as Commissioner Underwood mentioned, a very significant part of which is the consideration of the endangered species, which we will then use in our final biological opinion.

Senator BRADLEY. What measures are available to improve habitat for federally protected species?

Mr. SPEAR. Well, I think the basic subject here, the management of the power operations, is going to be the key issue for improving management.

Senator BRADLEY. Will there be a plan for the protection and restoration of federally protected species?

Mr. SPEAR. Yes. The whole result of the EIS process and the endangered species process will take that into account, and I think the endangered species activities will weigh very heavily on the final decision to do our best for those species.

I think we are looking at, to a great extent, stabilization of the humpback chub as the key issue. The possibilities of perhaps some expansion of the chub's habitat is going to be looked at. As far as the squawfish and the bonytail chub, we will look at that, but I would say that it is probably unlikely that we are going to be able to restore them, although that is part of the examination.

Senator BRADLEY. Well, let me thank the panel.

Do you have anything else to add?

[No response.]

Senator BRADLEY. Thank you very much for your testimony, and I am sure we will be in contact as this bill begins to move. Thank you very much.

I see Senator DeConcini here. Senator DeConcini, welcome to the subcommittee.

STATEMENT OF HON. DENNIS DeCONCINI, U.S. SENATOR FROM ARIZONA

Senator DeCONCINI. Mr. Chairman, thank you for letting me come in late and present the testimony that I have today on S. 2807.

Before I do that, Mr. Chairman, I understand the committee will also be taking testimony on S. 1556, the bill to rename the Fannin-McFarland Aqueduct on the Central Arizona Project.

Senator BRADLEY. That is on the hearing list today.

Senator DeCONCINI. That is what I understood, that it was. And I just wanted to be on record in support of that.

Senator BRADLEY. I know the Senator and I know of your strong interest in that bill. That is why it is on the list.

Senator DeCONCINI. And I appreciate, Mr. Chairman, your willingness to facilitate us in that particular special situation.

And I have a full statement, Mr. Chairman, I will submit for the record.

I very much appreciate the opportunity to testify on S. 2807, the Grand Canyon Protection Act of 1990. This legislation in my opinion represents a fair and equitable balance between the power generation requirements of the Glen Canyon Dam and the need to protect the natural and recreational resources of the beautiful Grand Canyon.

I also want to express my appreciation to my colleague, Senator McCain. He and his staff have worked long and hard, and my staff as well. And I am pleased to cosponsor this bill with him. We believe that the Grand Canyon is, indeed, the world's greatest spectacle to observe, and we want to do all we can to make sure that it is preserved.

Among the adverse impacts identified in the GCES final report included the erosion of beaches along the river. The water discharged by the dam is clear and cold, and thus giving a tremendous carrying capacity for sediment. As the saying goes, a clear river is a hungry river, and the Colorado River is a hungry river. It takes up beaches and a great deal of plants and other things. It impacts, needless to say, rafters and campers. However, it is the beaches that provide the habitat for wildlife and create backwaters for certain aquatic species.

Faced with the findings of the GCES Phase I and the length of time that it would take to prepare an EIS, Senator McCain and I wrote to Secretary Lujan in April of this year suggesting that he develop an interim operating criteria. We felt that these interim measures would protect the Grand Canyon while a search for a long-term solution was under way. We expressed to him that the interim criteria should not impact the timely completion of the EIS and the water delivery requirements of the Colorado River Compact. I felt at the time—and I still do—that the Secretary has adequate administrative authority to implement such interim operating criteria and that legislation was not necessary. However, as was expressed in our April letter, should the Secretary choose not to exercise his authority, we would reserve the right to pursue the legislative remedy.

All this brings us to S. 2807, and I understand, Mr. Chairman, my colleague has gone over the objectives of the bill. There are three. Quickly, (1) is to require the timely completion of the environmental impact statement currently under way on dam operations, and (2) while the EIS is being completed, the Secretary is to implement interim protective flows to mitigate the damages occurring to the canyon while the search for a long-term solution is underway. And (3) the bill requires the Secretary of the Interior to operate the dam in a fashion which will protect and mitigate damages to the natural and recreational resources of the Grand Canyon.

As I said earlier, I believe that the approach we have adopted in this bill balances the need to provide power and water against the need to protect the Grand Canyon. I do not believe that achieving these objectives is incompatible. This bill is not perfect. I realize that. And you may end up with some very good solutions and suggestions of additions or deletions that I would welcome working

with the committee. I look forward to the committee passing this bill in making what modifications they feel are necessary because I believe the committee will conclude that we need a legislative solution in light of the decision of the Secretary.

Thank you, Mr. Chairman.

[The prepared statement of Senator DeConcini follows:]

PREPARED STATEMENT OF HON. DENNIS DECONCINI, U.S. SENATOR FROM ARIZONA, ON S. 2807

Mr. Chairman; I very much appreciate the opportunity to testify this morning on S. 2807, the Grand Canyon Protection Act of 1990. This legislation, in my opinion, represents a fair and equitable balance between the power generation requirements of the Glen Canyon dam and the need to protect the natural and recreation resources of the Grand Canyon.

I also want to express my appreciation to my colleague from Arizona, Senator McCain. He and his staff have worked tirelessly to craft this legislation and I am pleased to join with him as a cosponsor. He has once again demonstrated his commitment to protecting the beautiful but fragile Grand Canyon.

The relationship between Glen Canyon dam and the Grand Canyon is truly unique. In the 27 years since this dam was built, it has provided water and energy to much of the southwest. It is representative of the interlocking structure of common allegiances that typify the Colorado River basin. The Colorado River Storage Project Act (CRSP), passed in 1956, authorized the construction of Glen Canyon Dam. CRSP also provided for the establishment of the Upper Basin fund into which revenues from power generation—mostly from Glen Canyon Dam would finance the construction of the other Upper Basin projects authorized by the Act. Further, the large reservoir behind the dam provides storage space in order that the Upper Basin could use its entitlement to Colorado River water.

The construction of the Glen Canyon dam has forever changed the Colorado River through the Grand Canyon. To assume that all of these changes are bad is simply not the case. The water released at the bottom of Glen Canyon dam is clear and cold. This has resulted in the creation of one of the best trout fisheries in the country. Fishing enthusiasts from around the world travel to Lee's Ferry in anticipation of catching four and five pound rainbow trout. Also, the dam has controlled seasonal floods which has allowed vegetation to grow along the banks of the Colorado River. This situation has contributed to this area becoming home to one of the most diverse bird populations in the southwest.

Another positive contribution of the dam is that it has evened the flows through the Canyon. Prior to the construction of the dam, the historic flows on the Colorado River through the Grand Canyon varied from almost nothing to more than 200,000 cubic feet per second. With the beginning of impoundment behind the dam, the flows are now more consistent and even. In order to meet the high urban energy demands during the summer months, more water is released from the dam and there are higher flows during this normally dry, but popular rafting period.

Notwithstanding these beneficial aspects, a number of studies have concluded that the operations of Glen Canyon dam are having an adverse impact on some of the natural and recreational resources of the Grand Canyon. In 1982, the Secretary of Interior initiated the Glen Canyon Environmental studies (GCES). These studies were meant to answer two principal questions: (1) Are the current dam operations adversely affecting the existing river related environmental and recreational resources of Glen and Grand Canyons? and (2) Are there ways to operate the dam, consistent with CRSP water delivery requirements, that would protect or enhance environmental and recreational resources? GCES did indeed conclude that some aspects of the operations of Glen Canyon dam were adversely affecting the downstream resources of the Grand Canyon and further concluded that modified dam operations could protect and enhance these resources.

Among the adverse impacts identified in the GCES final report included the erosion of the beaches along the river. As mentioned previously, the water discharged by the dam is clear and cold, thus giving it tremendous carrying capacity for sediment. As the saying goes, a clear river is a hungry river. Some may argue that the erosion of beaches impacts only a select number of rafters and campers. However, it is the beaches that provide the habitat for wildlife and create backwaters for certain aquatic species.

The GCES final report also identified a number of impacts on certain endangered species, particularly the Humpback Chub. It was determined that the lower river

temperatures are having a negative impact on this and a number of other native species. Also, the blue ribbon trout fishery created by the dam is being impacted by the way it is being operated. The fluctuating flows strand fish, interfere with fish reproduction, and impact fishing activities.

In response to these findings, the Department recommended that a second phase of the GCES be undertaken. Because these further studies would have likely led to a NEPA study and that an Environmental Impact Statement would provide the same information, Senator McCain and I wrote to Secretary Lujan in June of 1989 suggesting that the Department immediately begin preparing an EIS. On July 27, 1989, the Secretary ordered the Bureau of Reclamation to prepare an EIS. This document will identify the impacts of the current operations of the dam and determine what measures are needed to protect the downstream environment. It is expected to be completed by the end of 1992. Public interest in this process has been overwhelming. The Bureau has received over 17,000 written comments and more than 1,200 people have attended the hearings.

Faced with the findings of GCES Phase I and the length of time that it would take to prepare the EIS, Senator McCain and I again wrote to Secretary Lujan in April of this year suggesting that he develop an interim operating criteria. We felt that these interim measures would protect the Grand Canyon while a search for a long term solution was underway. We expressed to him that this interim criteria should not impact the timely completion of the EIS and the water delivery requirements of the Colorado River Compact. I felt at the time, and still do, that the Secretary has adequate Administrative authority to implement such interim operating criteria and that legislation was unnecessary. However, as was expressed in our April letter, should the Secretary choose not to exercise this authority, we would reserve the right to pursue a legislative remedy.

All this brings us to S. 2807. The bills major objectives are three fold: (1) It requires the timely completion of the environmental impact statement currently underway on dam operations; (2) while the EIS is being completed, the Secretary is to implement interim, protective flows to mitigate the damages occurring to the Canyon while the search for a long-term solution is underway; and (3) the bill requires the Secretary of Interior to operate the dam in a fashion which will protect and mitigate damages to the natural and recreational resources of the Grand Canyon.

As I said earlier, I believe that the approach we have adopted in this bill balances the need to provide power and water against the need to protect the Grand Canyon. I do not believe that achieving these objectives is incompatible. This bill is not perfect, and this morning you will hear testimony from individuals representing a number of different groups with suggestions on how to improve it. I look forward to reviewing these recommendations in order that we may ultimately pass the best bill possible. I also look forward to working with you, Mr. Chairman, as this legislation moves forward.

Again, thank you for the opportunity to appear before you this morning.

Senator BRADLEY. Thank you very much, Senator DeConcini. Thank you for your testimony.

Our next panel consists of Ed Norton, Executive Director of Grand Canyon Trust; Martin Litton, river guide from Menlo Park, California; John Echeverria, Vice President, American Rivers; and Rob Elliott, Vice President of Western River Guides Association in Flagstaff, Arizona.

Let me welcome all of you to the subcommittee. I hope that you will be able to summarize your testimony, and I look forward to hearing it.

Why do we not begin with Mr. Norton? Welcome to the subcommittee. It is good to see you on this subject. I welcome your testimony.

STATEMENT OF EDWARD M. NORTON, JR., PRESIDENT, GRAND CANYON TRUST

Mr. NORTON. Thank you, Senator Bradley.

My name is Edward Norton. I am President of the Grand Canyon Trust. The trust is a regional conservation organization headquar-

tered in Flagstaff. We work on public lands, water, wildlife, other natural resource issues of the Colorado Plateau. I am delighted to be here this morning, and thank you for inviting me here to testify concerning the Grand Canyon Protection Act of 1990.

The Grand Canyon Trust strongly supports this legislation, and I want to begin my testimony by expressing our thanks for the leadership of Senator McCain and Senator DeConcini in crafting and introducing this bill and for your keen interest in Glen Canyon Dam operations over the last year and your willingness to hold hearings on this subject.

I am going to submit my entire testimony for the record, and address the matter which I believe that really lies at the heart of this entire issue.

Senator Bradley, I heard your question to the Commissioner of Reclamation, Dennis Underwood, when you asked him, Mr. Underwood, as I understand your testimony, you are saying basically trust us. What would you say to a skeptic? I listened very carefully to the answer, and I must say to you that I remain a skeptic. In fact, I remain a raving skeptic. And in fact, I remain a true disbeliever, with all due respect to the Commissioner, and let me tell you why.

Senator Wallop also asked the question, if the Secretary of the Interior has the authority to protect the canyon, does this legislation not simply intervene when it is not necessary. I fully agree the Secretary of the Interior does have the authority to protect the Grand Canyon. Indeed, he has ample authority. The point is that for the last 15 or 20 years, no Secretary of the Interior has exercised that authority for the protection of the canyon despite the pleas of many of us in the environmental and recreational community.

In fact, the situation is even worse. Until this legislation was introduced, the Federal Government, the Western Area Power Administration and the Department of the Interior has adamantly denied that they had the authority to protect the canyon. They took the position that their discretion was limited. They took the position that section 7 of the Colorado River Storage Project limited their authority. The operative policy was that power generation and, indeed, peaking power generation has total primacy.

There were several instances, and I think it is important to point out where that position was taken. After the Glen Canyon Environmental Studies Final Report in 1988 was released, the various Federal agencies met as an executive review committee. The Western Area Power Administration took the position at the executive review committee that section 7 of the Colorado River Storage Project Act's requirement to produce the greatest practical amount of firm power and energy overrides and displaces all other purposes and values and uses of the Colorado River. The Secretary of the Interior, according to the Western Area Power Administration, has little or no authority or discretion to consider any value other than power generation, and specifically, Senator Bradley, WAPA argued before the executive review committee that establishing higher minimum flows at certain times to improve rafting or the fisheries would violate section 7 of the CRSP Act.

That was also the position that the Federal Government took in litigation brought against the Western Area Power Administration by the Grand Canyon Trust, the National Wildlife Federation, the Western River Guides Association, and American Rivers. The linchpin of the government's position in that case was that section 7 limits the discretion of Federal authorities in deciding how power should be marketed or the dam should be operated, limited their discretion to the point where they were not even required to do an environmental impact statement.

So, I think that given that background, that we are fully entitled to be highly skeptical of the position that the Secretary of the Interior is willing to exercise authority to protect the Grand Canyon. And the great virtue in my mind of this legislation is that it puts to rest a question that has clouded this entire issue for the last 10 or 15 years. It drives a stake through the heart of this proposition that power has total primacy over all other values and uses of the Colorado River.

Senator Wallop also asked the question as to whether or not since the Secretary is providing under NEPA, Congress should not step in now.

Senator BRADLEY. Mr. Norton, if I could interrupt you. You hear the buzzers. There is a vote on. I have 7 minutes to vote. So, we will stand in recess temporarily, and I will be back within 10 to 12 minutes. Again, I apologize.

[Recess.]

Senator BRADLEY. The subcommittee will come back to order. And I apologize to the panel. Mr. Norton, you were in the middle of your testimony.

Mr. NORTON. I am drawing near the end of it, Senator Bradley, because I know we are a little behind schedule, and I want to give the other individuals on this panel and other panelists a full opportunity.

One of the matters raised by Senator Wallop was why, since the Secretary is proceeding now under NEPA and preparing an EIS, that Congress should step in, and he suggested that Congress should not. We strongly believe that this is exactly the time that Congress should step in. After all, the National Environmental Policy Act and an environmental impact statement do not have anything to do with a result. NEPA is a statute that takes place in the context of other Federal laws which tell agencies how they should go about their business. And I think that given the controversy that has occurred over the last 10 to 15 years, that it is very important for Congress at this threshold stage to establish the context clearly so that when we have an EIS and a decision 3 or 4 years from now, it is not clouded by continued controversy.

I will be happy to respond to any further questions you might have about this. Thank you very much.

[The prepared statement of Mr. Norton follows:]

PREPARED STATEMENT OF EDWARD M. NORTON, JR., PRESIDENT OF THE GRAND CANYON TRUST, ON S. 2807

Good morning Mr. Chairman. My name is Edward M. Norton, Jr. I am President of the Grand Canyon Trust, a regional conservation organization headquartered in Flagstaff, Arizona. The Grand Canyon Trust's mission is the protection, preserva-

tion, and wise management of the public lands, water, wildlife, and other natural resources of the Colorado Plateau. Thank you for the invitation to testify before this Subcommittee concerning S. 2807, the Grand Canyon Protection Act of 1990.

The Grand Canyon Trust strongly supports this legislation, and I want to begin my testimony by expressing our appreciation for the leadership of Senator McCain and Senator DeConcini in crafting and introducing this bill and for your attention during the last year to the issue of the impact Glen Canyon Dam operations has on the Grand Canyon and for your willingness to hold these hearings today.

HISTORY AND BACKGROUND

The Grand Canyon Protection Act of 1990 squarely addresses both a serious environmental problem—the substantial adverse impact of Glen Canyon Dam operations on the downstream environment in the Grand Canyon—and an equally serious governmental or institutional problem—the reluctance and willful refusal of the Bureau of Reclamation and the Western Area Power Administration ("WAPA") to confront and change operating policies and practices that are causing damage to the resources of one of our greatest national parks.

These two problems have a long history that is extremely relevant to understanding why this legislation is necessary. This history, I respectfully submit, is not one in which the government agencies charged with stewardship over our public resources should take much pride.

Environmentalists and representatives of the recreation industry have, for at least the last fifteen years, called attention to the damage to the downstream environment in the Grand Canyon being caused by the operation of Glen Canyon Dam. In 1982, in response to public concern over dam operations and Bureau of Reclamation proposals to "uprate" generating capacity at Glen Canyon Dam for the purpose of increasing "peaking power" generation, the Secretary of the Interior initiated the Glen Canyon Environmental Studies ("GCES"). The Bureau of Reclamation, in cooperation with the National Park Service, the Fish and Wildlife Service, and appropriate state agencies, was charged with the task of performing a wide range of technical studies on sediment transport, beach erosion, vegetation, wildlife, endangered species, the fishery, and other environmental resources. The Bureau was also required to undertake an analysis of alternative operating criteria for Glen Canyon Dam. The Department of the Interior directive establishing the Glen Canyon Environmental Studies clearly stated that if the studies indicated adverse impacts from dam operations and identified feasible alternatives to existing operating criteria, consistent with Colorado River Storage Project Act requirements, then the Department of the Interior should prepare an Environmental Impact Statement under the National Environmental Policy Act ("NEPA") and initiate a decision making process to determine appropriate long term operating criteria for Glen Canyon Dam.

In January 1988—after five years of study, the completion of 30 technical reports by more than 100 researchers and the expenditure of more than \$7,000,000—the Department of the Interior released the Glen Canyon Environmental Studies Final Report. The report concluded that flood releases and the widely fluctuating releases of water for peaking power generation are rapidly and irreversibly eroding beaches and the riparian zone in the Grand Canyon; destroying vital aquatic and land habitat for fish and wildlife, including several threatened and endangered species; changing the character and quality of the recreational experience on the Colorado River in the Grand Canyon; and jeopardizing the blue ribbon trout fishery that has developed below Glen Canyon Dam.

Most significantly, the Glen Canyon Environmental Studies Final Report also concluded that alternative operating criteria for the dam—operating criteria that were consistent with the water storage and delivery requirements of the Colorado River Compact—would mitigate the impact of dam operations on the downstream environment and, in some cases, enhance environmental resources.

The Glen Canyon Environmental Studies Final Report expressly stated that "This report was not intended to lead directly to changes in dam operations." The National Research Council of the National Academy of Sciences in its review of the Glen Canyon Environmental Studies recommended that additional information about the impact of dam operations and about the economic impact of changing dam operations was needed before long term decisions about changing dam operations could be made. The Council also concluded that:

Insufficient attention to early planning and careful articulation of objectives. This lack of planning has led to an appearance that the bureau [of Reclamation] is not fully open to changes that might be suggested as a result of research done

by the GCES investigations, or that by limiting the scope, unwanted options would not be examined.

Environmental organizations and recreational interests agreed that the Glen Canyon Environmental Studies did not provide an adequate basis for final long term decisions about the operation of Glen Canyon Dam. However, we strongly urged the Secretary of the Interior and the Bureau of Reclamation that the conclusions of the GCES final report satisfied the threshold test, established by the Bureau of Reclamation in 1982 when it initiated the studies, for preparation of an Environmental Impact Statement leading to a decision making process on long term operating criteria for Glen Canyon Dam.

The National Park Service also recommended the preparation of an Environmental Impact Statement on Glen Canyon Dam operations. However, the Bureau of Reclamation, the Western Area Power Administration, and the public power interests strongly opposed initiating the NEPA process, although WAPA and the public power interests also asserted that any changes in Glen Canyon Dam operations, including even changes for test flows to conduct additional studies under the GCES—Phase II program, would require full compliance with the National Environmental Policy Act.

The Secretary of the Interior refused to initiate the process provided under the National Environmental Policy Act. Instead, in June 1988, the Department of the Interior simply directed the Bureau of Reclamation to engage in additional studies of the impact of dam operations on the downstream environment and the economic impact of changing dam operations. Glen Canyon Environmental Studies—Phase II, designed to take a minimum of two or three years, were open ended, undirected, and deliberately not designed to lead to a decision about Glen Canyon Dam operations. After the completion of the GCES Phase—II program, the Department of the Interior would decide whether a decision about changes in dam operations was necessary and then initiate the preparation of an Environmental Impact Statement. The Department of the Interior's policy meant that, despite more than a decade of debate and study and clear evidence of serious environmental damage in the Grand Canyon, no decision about Glen Canyon Dam operations would be made until virtually the end of the 20th century.

Members of Congress and many concerned citizens strongly protested this policy of deliberate delay. In July 1989, responding to Congressional pressure and public outcry, Secretary of the Interior Lujan announced that he would direct the Bureau of Reclamation to prepare an Environmental Impact Statement on Glen Canyon Dam operations for the purpose of determining impacts and developing operating criteria for the dam.

On September 29, 1989—in a lawsuit brought by the Grand Canyon Trust, the National Wildlife Federation, the Western River Guides Association, and American Rivers—the United States District Court for the District of Utah enjoined the Western Area Power Administration from implementing its Post 1989 Marketing Criteria for hydroelectric power generated at Colorado River Storage Project Facilities, including Glen Canyon Dam, until WAPA completes an adequate, court approved Environmental Impact Statement. The court found that the agency had been "recalcitrant and reluctant" in its decision not to prepare an EIS. In a subsequent proceeding for attorneys' fees under the Equal Access to Justice Act, the court found that WAPA's legal position in resisting compliance with NEPA "was not substantially justified."

A second, and equally important aspect of the history of the long controversy over Glen Canyon Dam operations is the repeated and consistent assertion by the Bureau of Reclamation and the Western Area Power Administration that power generation has complete primacy over all other values, uses, and resources of the Colorado River.

After the Bureau of Reclamation issued the Glen Canyon Environmental Studies Final Report ("GCES") in January 1988, the Secretary of the Interior appointed an Executive Review Committee—with representatives from the Bureau of Reclamation, the U.S. Fish and Wildlife Service, the National Park Service, WAPA, and the Arizona Fish and Game Department—to make recommendations based upon the Glen Canyon Environmental Studies. In the Executive Review Committee's report to the Secretary of the Interior, WAPA asserted in a written legal opinion that Section 7 of the Colorado River Storage Project Act of 1956 requires all CRSP projects, of which Glen Canyon dam is by far the largest generator of electricity, to be "operated at their (sic) most productive rate—to produce the greatest practicable amount of firm capacity and energy." According to WAPA, Section 7's requirement to produce "the greatest practicable amount of firm power and energy" overrides and displaces all other purposes, values, and uses; the Secretary of the Interior has little

or no discretion to consider any value other than power generation. Specifically, WAPA argued in the Executive Review Committee Report that establishing higher minimum flows at certain times to improve rafting or fishing would violate Section 7 of the CRSP Act.

The Department of the Interior's Regional Solicitor in Salt Lake city, in a memorandum dated June 6, 1988 to the Director of the Bureau of Reclamation for the Upper Colorado Region, challenged WAPA's interpretation of Section 7 of the Colorado River Storage Project Act and pointed out that the Colorado River Basin Project Act of 1968, the "1968 Act") 43 U.S.C. Sections 1501 et seq. provides that:

This program is declared to be for the purposes, among others, of regulating the flow of the Colorado River; controlling floods; improving navigation; providing for the storage and delivery of the waters of the Colorado River for reclamation of lands, including supplemental water supplies, and for municipal, industrial, and other beneficial purposes; improving water quality; *providing for basic public outdoor recreation facilities; improving conditions for fish and wildlife, and the generation and sale of electrical power as an incident of the foregoing purposes.* (Emphasis added.)

43 U.S.C. Section 1501(a).

The Regional Solicitor further pointed out that the Colorado River Basin Act of 1968 specifically provides that Section 7 of the Colorado River Storage Project Act of 1956 shall be administered in accordance with the criteria established by the Secretary of the Interior under the 1968 Act. The first criteria issued under the 1968 Act by Secretary Hickel in 1970 provided that the reservoirs in the Colorado River Storage Project should be operated with appropriate consideration of their uses for all purposes, "including flood control, river regulation, beneficial consumptive uses, power production, water quality control, recreation, enhancement of fish and wildlife, and other environmental factors."

The Regional Solicitor referred the matter to the Associate Solicitor for Energy and Resources and the Associate Solicitor for Conservation and Wildlife. The Solicitor's office took no action. Representatives of the environmental organizations have met with the Commissioner of Reclamation and the Assistant Secretaries for Water and Science and Fish and Wildlife and Parks seeking a resolution of this critical threshold issue.

Finally, in the lawsuit filed by the Grand Canyon Trust, the National Wildlife Federation, the Western River Guides Association, and American Rivers against WAPA for failing to prepare an EIS on the Post 1989 Power Marketing Criteria for electricity generated at CRSP facilities, the Department of Justice asserted that "power has primacy." Indeed, "power has primacy" was the linchpin of WAPA's defense in the case. WAPA argued that under Section 7 of the Colorado River Storage Project Act, "power has primacy" and the Federal agencies have little or no discretion in determining how Glen Canyon Dam is operated.

THE GRAND CANYON PROTECTION ACT OF 1990

The Grand Canyon Protection Act of 1990 thus comes before the United States Senate and this Subcommittee at a critical juncture. Both the Bureau of Reclamation and the Western Area Power Administration have begun the preparation of Environmental Impact Statements on agency policies and decisions that will determine how Glen Canyon Dam should be operated.

S. 2807 accomplishes several important objectives. First, and most important, the bill requires the Secretary of the Interior to protect the downstream resources in the Grand Canyon when making decisions about Glen Canyon Dam operations. Section 3 and Section 5 provide clear and unequivocal guidance to the Secretary of the Interior and to the Western Area Power Administration as those two Federal agencies prepare Environmental Impact Statements on policies and actions which affect Glen Canyon Dam operations. These sections are essential because the Bureau of Reclamation and the Western Area Power Administration have asserted that power generation has complete and total primacy in determining how Glen Canyon Dam should be operated.

Second, the bill requires the Secretary of the Interior to set interim operating criteria for Glen Canyon Dam which will protect the downstream environment during the time in which the Bureau of Reclamation and WAPA are preparing Environmental Impact Statements.

Finally, S. 2807 provides for a long term research and monitoring program to evaluate the impact of dam operations over time in order that adjustments can be made to operating procedures based upon the most accurate scientific information and analysis.

RECOMMENDED MODIFICATIONS TO S. 2807

The Grand Canyon Trust strongly opposes section 5(d) of S. 2807 which provides that "All direct costs of preparing the environmental impact statement . . . shall be nonreimbursable." We believe that the costs of mitigating adverse environmental impacts should be treated as a cost of operation and should be fully reimbursable and funded from charges paid by power customers. The costs of the Glen Canyon Environmental Studies have been appropriately treated as reimbursable. This policy should not be changed for the Bureau of Reclamation's EIS.

Section 3 of the bill requires the Secretary of the Interior to "*operate Glen Canyon Dam* in such a manner as to protect, mitigate adverse impacts to, and improve the conditions of the natural resources of Grand Canyon National Park . . . under *operating criteria* . . ." (emphasis added). However, other sections of the bill—specifically Section 4 and Section 5(b)—refer to "power operating criteria." We recommend that the bill maintain the language of Section 3 requiring the Secretary of the Interior to develop "operating criteria" as opposed to "power operating criteria." Both interim and final operating criteria must address all aspects of dam operations so long as those operating criteria are consistent with and do not in any way change upon the water storage and delivery requirements of the Colorado River Compact and other laws relating to water storage and delivery.

Thank you again for the opportunity to testify this morning, Mr. Chairman. I will be delighted to answer any questions you or other members of the Subcommittee may have.

Senator BRADLEY. Thank you very much, Mr. Norton.
Mr. Echeverria.

STATEMENT OF JOHN D. ECHEVERRIA, VICE PRESIDENT AND
CONSERVATION DIRECTOR, AMERICAN RIVERS, INC.

Mr. ECHEVERRIA. Thank you, Mr. Chairman.

My name is John Echeverria. I am the Vice President and Conservation Director of American Rivers. I appreciate the opportunity to testify. I have submitted written testimony. With your permission, I will highlight the key points.

First, let me emphasize that we strongly support the enactment of legislation to protect the Grand Canyon, truly one of this Nation's great treasures. The enactment of this legislation would represent one of the most important environmental accomplishments of the 101st Congress. We commend you, Chairman Bradley, and Senators McCain and DeConcini for your leadership on this issue.

Let me follow Mr. Norton's enthusiastic statement of why this legislation is needed. I think the 15 years of inaction and intransigence on the part of the Department of the Interior and the documented need to address environmental damage that is ongoing in the canyon adequately support prompt legislative action.

I am going to confine the balance of my testimony to some detailed comments on the bill as proposed and some suggested improvements for the legislation.

First, we believe that the committee should clarify the language of the bill that deals with the goals and purposes that the Secretary should follow in managing Glen Canyon Dam. Section 3 of the bill establishes a new explicit legal requirement that the Secretary operate Glen Canyon Dam in such a manner as to protect, mitigate adverse impacts to and improve conditions in Grand Canyon National Park and the national recreation area pursuant to criteria that are consistent with the dam's essential water storage and delivery functions. While we believe that the Secretary already has a mandate to protect downstream resources, the bill provides a needed clarification. In particular, this provision will put to rest

the argument that has been raised by the Western Area Power Administration that power generation has primacy over environmental resources.

Parenthetically, it is also worth noting that the operating criteria that have been referred to by Commissioner Underwood and others are regulations. They are not law, and one of the advantages of this bill is it places in the U.S. Code a clear mandate to address all the factors that need to be addressed in managing the Glen Canyon Dam.

While we believe section 3 is an appropriate amendment to the law, we questioned the need for the inclusion of section 2, subsection 5 in the findings section which sets forth some findings as to the meaning of certain laws relating to Glen Canyon Dam. Since in substance the findings are virtually identical to the law section 3, we believe the inclusion of those findings would be redundant and simply confusing.

Second, we recommend that the committee revise the bill to direct the Secretary to adopt emergency interim criteria to protect downstream resources not after the end of the study flows, but immediately following the enactment of the law, within 60 days of enactment of the law. The bill should provide the pending completion of the ongoing data collection of the Grand Canyon. The study flows would take priority over interim operating criteria which would apply between the test periods.

In our view, the Secretary has sufficient information to adopt interim emergency criteria. The final report of the GCES concluded unequivocally that reducing the frequency of flooding and the amplitude of flow fluctuations would benefit Grand Canyon resources. The report acknowledged that further data collection was necessary, but it also stated that it was the belief of the study preparers that further data collection was not going to change the fundamental conclusion about ongoing damages. The findings in S. 2807 endorse that essential conclusion of the GCES final report.

Furthermore, even as it is presently drafted, S. 2807 would require the Secretary of the Interior to implement interim operating criteria in about a year regardless of whether new data is collected and regardless of what the new data show. In other words, the bill rests on the assumption that there is enough information to adopt appropriate interim criteria. Since enough information is at hand, we think the bill should be revised to direct the Secretary to adopt and implement interim criteria immediately.

Senator BRADLEY. Mr. Echeverria, I am sorry. We are pressed for time. So, if you could give us a summary of your other suggestions.

Mr. ECHEVERRIA. The only point that has been raised in opposition to the adoption of interim criteria has been that interim criteria would interfere with tests that are now under way. I understood Commissioner Underwood in his response to a question from you, Chairman Bradley, to acknowledge that the senior scientist of the GCES effort has concluded that adopting interim flows between test periods would have no effect on the reliability or accuracy of the studies. He did raise the concern that it might affect the allocation of water. As he said, the amount of water available is the amount of water under the curve. And a certain amount of water has been planned for to be released during the periods between test

flows. And I think there is no reason why immediately interim flows could not be adopted. The amount of flow might be less than would otherwise be possible after the test period, but nonetheless, interim flows are feasible and could be instituted immediately.

Let me just briefly mention my third and fourth points.

Thirdly, we think that the bill should be revised to indicate clearly that when the Secretary adopts interim operating criteria, it would be unnecessary to go through a formal NEPA process. These are short-term interim criteria pending the completion of a full-scale EIS. We do not need an EIS before we complete the full-scale EIS.

Second of all, we would oppose inclusion of the provision that provides that all the costs of the EIS would be nonreimbursable. We believe they should be reimbursable costs.

Thank you for your patience.

[The prepared statement of Mr. Echeverria follows:]

PREPARED STATEMENT OF JOHN D. ECHEVERRIA, VICE PRESIDENT AND CONSERVATION DIRECTOR, AMERICAN RIVERS, INC., ON S. 2807

My name is John D. Echeverria. I am the Vice President and Conservation Director of American Rivers, Inc., the only national conservation organization dedicated exclusively to the protection and enhancement of our nation's rivers. I appreciate the opportunity to testify this morning.

American Rivers strongly supports the enactment of legislation to protect the Grand Canyon, one of this country's great natural treasures. The need for legislative action is abundantly clear. The Glen Canyon Environmental Studies (GCES) conducted over many years at a cost of more than \$7,000,000, document that the current operations of Glen Canyon Dam are causing serious injury to environmental and recreational resources in the Grand Canyon. The GCES also identify available methods for operating the dam differently to reduce these impacts. Equally important, the Department of the Interior has repeatedly demonstrated its inability or unwillingness to address the serious problems in the Grand Canyon.

S. 2807, the Grand Canyon Protection Act of 1990, seeks to achieve three important goals. First, it would clarify the law governing the operations of Glen Canyon Dam and affirm that the dam must be operated to protect, mitigate damages to, and improve downstream natural resources. Second, the bill directs the Secretary to complete the preparation of an Environmental Impact Statement on Glen Canyon Dam by a date certain, and requires the Secretary to implement new, long-term operating criteria to ensure that the dam is operated in a way that protects downstream resources. Finally, the bill directs the Secretary, pending the completion of the EIS process, to adopt interim operating criteria to minimize the ongoing harm from the dam's present operations.

The enactment of legislation to protect the Grand Canyon will represent one of the most important environmental accomplishments of the 101st Congress. We commend Senators McCain and DeConcini, and Chairman Bradley, for their initiative in introducing this important piece of legislation.

While American Rivers believes the bill as drafted goes a long way in resolving the current controversy over the operations of Glen Canyon Dam and provides very useful guidance for future dam operations, we believe the bill needs to be strengthened in four important areas. I will address each of these areas in turn.

First, we recommend that the Committee clarify the language of the bill that provides guidance on the goals and purposes that the Secretary should follow in managing Glen Canyon Dam.

Section 3 of the bill establishes a new, explicit legal requirement that the Secretary operate Glen Canyon Dam "in such a manner as to protect, mitigate adverse impacts to, and improve conditions" in Grand Canyon National Park and Glen Canyon National Recreation Area, pursuant to criteria that are consistent with the dam's essential water storage and delivery functions. While American Rivers believe that the Secretary already has a mandate to protect downstream resources, we believe the bill provides needed clarification. In particular, this provision will put to rest an argument raised by the Western Area Power Administration that power generation has primacy over environmental resources.

American Rivers questions, in light of the inclusion of section 3 in the bill, the need for section 2, subsection 5, setting forth findings as to the meaning of certain laws relating to Glen Canyon Dam and the Grand Canyon. Since, in substance, the findings are virtually identical to the law as established in section 3, the inclusion of the findings is redundant and confusing. It is important that Congress use the occasion of this legislative initiative to clarify the law.

Second, American Rivers recommends that the Committee revise the bill to direct the Secretary to adopt emergency interim operating criteria to protect downstream resources in the very near future, for example, within 60 days of the enactment of the law. The bill should provide that, pending the completion of the ongoing data collection process, study test flows will take priority over flows pursuant to the interim operating criteria.

In American Rivers' view, the Secretary has sufficient information at this time to adopt interim emergency operating criteria. The Final Report of the Glen Canyon Environmental Studies, released in January 1988, concluded unequivocally that reducing the frequency of flooding and the amplitude of flow fluctuations would benefit Grand Canyon resources. While the report acknowledged that, even after 5 years of study, further information gathering was appropriate, the report stated that additional data would not alter the report's fundamental conclusions. The findings in S. 2807 endorse these basic conclusions of the GCES Final Report: the Bill finds that "the substantial adverse effects of current power operations of Glen Canyon Dam can be at least partially mitigated by development and implementation of interim power operating criteria."

Furthermore, even as it is presently drafted, S. 2807 would require the Secretary of the Interior to implement interim emergency operating criteria in about one year regardless of whether any additional data are collected and regardless of what the data show. In other words, the bill as drafted rests on the proper conclusion that the Department already has enough information in hand to adopt interim operating criteria. In our view, since the Department already has sufficient information to support interim operating criteria, he should be directed to adopt and implement such criteria immediately.

The only logical justification that has been offered for delaying the adoption and implementation of interim criteria is that the adoption of such criteria might potentially interfere with the ongoing data collection. After reviewing prior testimony and speaking with knowledgeable experts, we cannot find any basis for this concern.

There would be no direct conflict between the flows prescribed for study purposes and the flows required under the interim operating criteria. Every proposal for the adoption of interim criteria, including section 4(a) of S. 2807, contemplates that the study flows prescribed by the EIS team for study purposes would always take priority over the interim flows.

Furthermore, we know of no cogent explanation for the concern that the institution of interim operating criteria might adversely affect the reliability of the data collection process. It is our understanding that the sediment transport and other studies now being conducted are short-term in nature, and do not relate in any way to the dam's operations either prior to the initiation of the studies or during the periods between the test flows. Thus, implementation of new interim criteria apparently would have no bearing on the reliability or accuracy of the study results. In fact, if anything, adoption of interim criteria, which would ensure more constant conditions between test periods, actually might contribute to the reliability of the scientific investigations.

American Rivers notes that section 4 of S. 2807 refers to interim "power" operating criteria. Similarly, section 5(b) of the bill refers to "power" operating criteria. Since the operating criteria would address, among other things, the frequency of flooding, the criteria would influence more than day-to-day power operations. Moreover, it is critically important that the new operating criteria address flood releases because, as documented in the GCES Final Report, flood releases have particularly serious adverse effects on resources in the Grand Canyon. Accordingly, we suggest that section 4 and section 5(b) be revised throughout by substituting "dam" operating criteria for "power" operating criteria.

Third, American Rivers is concerned about how the requirements of the National Environmental Policy Act might be used to thwart Congress' efforts to halt the degradation of Grand Canyon resources. S. 2807 is silent on the application of NEPA to the development of interim operating criteria.

It can be argued that the public review process set forth in section 4 of the bill provides the functional equivalent of the NEPA process. Given this process, and the need for expeditious implementation of the interim criteria, more elaborate NEPA procedures are arguably unnecessary and not required.

Nonetheless, to remove any possible ambiguity on this score, we recommend that the Committee revise the bill to make clear that more elaborate NEPA procedures will not be required. Specifically, we urge the addition of a new section 4(g) stating that "The requirements of this section are deemed to satisfy the requirements of section 102(2)(C) of the National Environmental Policy Act for the purposes of the Secretary's decision to adopt and implement interim dam operating criteria."

Fourth, American Rivers strongly objects to section 5(d) of S. 2807, which provides that "All direct costs of preparing the environmental impact statement shall be nonreimbursable." In our view all of the costs of preparing the EIS should be funded from Colorado River Storage Project reimbursable operations and maintenance monies, which are funded from the charges paid by power customers.

All of the costs of the Glen Canyon Environmental Studies, which preceded and supported the EIS process, have been considered a reimbursable cost. There is no good reason to change the financing arrangements now. More importantly, the cost of mitigating the adverse environmental effects of Glen Canyon Dam are appropriately assigned to those who for many years have most directly benefited from the construction of Glen Canyon Dam.

Thank you again Mr. Chairman for the opportunity to testify. I will be happy to respond to any questions that you or other members of the Committee may have.

Senator BRADLEY. Thank you.

Mr. Elliott.

STATEMENT OF ROBERT L. ELLIOTT, VICE PRESIDENT, WESTERN RIVER GUIDES ASSOCIATION, FLAGSTAFF, AZ

Mr. ELLIOTT. Senator Bradley and esteemed members of the committee, my name is Rob Elliott. I am speaking as Vice President of the Western River Guides Association as a river concessionaire in Grand Canyon since 1974, as a Colorado River guide since 1965. I am honored to be given the opportunity to speak with you today.

The Colorado River through the Grand Canyon is my second home. One of my greatest joys has been introducing people to its depth and wonder. One of my greatest pains has been to witness its destruction.

When I first started guiding in the mid-1960's, there were wide, expansive beaches in most parts of the canyon. Most of these beaches have been reduced to half or less of their former size. Many of the camps have been entirely eliminated. Many of the good things that happen on a river trip happen on beaches, since one of my colleagues. You cannot make camp without them. You cannot sleep on the rocks. You cannot sleep standing against a tree.

But we have lost more than just sand. Along with the beaches go riparian ecosystems, backwater nurseries for native fish and fragile marsh habitats. With each day of fluctuating flows, the river loses a bit more of its resilience and its ability to bounce back from man and nature's impact.

The Glen Canyon Environmental Studies Final Report of January 1988 concluded that there are substantial adverse effects on downstream environmental and recreation resources and that modified operations could protect or enhance most resources. My personal experience over the past 25 years supports these same conclusions.

We arrived at this state of affairs quite simply through compromise and neglect. Glen Canyon was understood, or so we thought, as a necessary sacrifice. But we failed to ask what the impacts would be on the Grand Canyon.

Unbelievably, the primacy of power has been advanced in practice even without primacy under the law.

"Flexibility has been carefully built into every step of the power production process save one," says Dr. Steven Carothers. The power contracts are rigid, long-term economic commitments that essentially demand selectively maximized power production guaranteeing amounts of power over a period of time with an incalculable number of unforeseen variables.

Much of the uncertainty inherent in long-term power contracts has been eliminated by ignoring the need to provide for recreation and to maintain the environment. Dr. Carothers makes a compelling point that inflexible power contracts have been accommodated within a system which demands flexibility only by ignoring the environment.

After a decade of unfulfilled promises to study the environmental effects of Glen Canyon Dam, the Bureau of Reclamation has begun an environmental impact statement brought about, however, only through extraordinary pressure from the public, from the courts and from the Congress. We owe much gratitude to you, Mr. Chairman, and Senators McCain and DeConcini for helping apply the pressure when and where it was needed.

Grand Canyon National Park and Glen Canyon National Recreation Area desperately need the protection afforded by the subject legislation. It is brilliantly conceived and framed. It presumes correctly that the Secretary of the Interior will not of his own volition take emergency or interim corrective action to protect environmental and recreation resources downstream from Glen Canyon Dam. I do not challenge the notion that the Secretary has discretion to manage the dam. The Secretary has had the evidence, the legal mandate and the opportunity to act responsibly to protect the resources in Grand Canyon for years. Through lack of courage, vision and leadership, he simply has failed to provide such protection.

The genius of this bill is it simply directs the Secretary to operate Glen Canyon Dam in such a manner as to protect, mitigate adverse impacts to, and improve the conditions of the natural resources of the Grand Canyon National Park and Glen Canyon National Recreation Area without altering the Colorado River Storage Project Act.

CRSP does not need to be tampered with to achieve the protection we seek for the Grand Canyon and Glen Canyon National Recreation Area. This bill contains no threat to the Colorado River Basin Compact or the water allocation process, and it should not. The Basin States need flexibility to protect their water delivery commitments. The priority of water delivery is clearly maintained in the subject legislation.

Another strength of the bill is the provision for setting interim flows. It has been a challenge to arrive at the best possible schedule for implementation of these interim flows. My first impression of the draft legislation was that it was quite complex. After I reviewed it carefully, it seemed very logical and to make sense.

But my third impression, Mr. Chairman, was that you must be frustrated with the Secretary. How can you be so nice to him? You are giving the Secretary a lot of the benefit of the doubt when you know he is going to delay implementation of interim flows until

the very last minute allowed by the legislation. You could make it a whole lot more simple and just say September 1, 1991, because he is going to wait as long as he can.

I provide further challenge to Mr. Underwood's assertion that interim flows interfere with research flows. Senior scientist Duncan Patten, other scientists including David Wegner, the program manager for the Grand Canyon environmental studies, have asserted without question of their assertions that they have the data to recommend interim flows immediately based on Phase I of the Glen Canyon environmental studies, and they further assert that the interim flows would not compromise the scientific foundation to the environmental impact statement. I hate to see any kind of further delay when I see so clearly in my mind's eye the sand eroding away from hundreds of beaches this very minute.

There are 2½ years between the end of the scientific research collection and the end point that the legislation prescribes in finalization of the environmental impact statement. During this period of time, there will be a tremendous amount of further degradation and interim flows are necessary and a requirement to protect the canyon during this period.

Lastly I would like to address the requirement that the Secretary implement a program for long-term scientific monitoring. I suggest that scientific monitoring is simply too bland a term to effect what is clearly your intent in this legislation. The data truly necessary to meet the section 3 protection requirement will not be in hand even after the EIS is completed, according to Duncan Patten and the other scientists. The legislation must ensure that the Secretary does far more than just monitor the effects of the new power operations of Glen Canyon Dam. The Secretary must actively seek the additional information which will provide the basis for adjusting those operations in the future.

Upon review of the EIS, the Secretary will be faced with the great challenge of creating an adaptive management tool that will preserve basic natural and recreational resource values which is supported by a continuing improvement in data analysis and understanding how this complex system works.

The Secretary is not up to the assignment. At least he is not up to the assignment without your assistance and direction. So, please work with us in making this part of the legislation as strong as we possibly can.

In conclusion, in order to protect the Grand Canyon, priorities have to be reestablished and acted upon. The subject legislation accomplishes this need exceptionally well. Protecting the Grand Canyon is every bit as important as producing hydroelectric power at bargain basement prices.

When it comes to the environment, we have been continually compromising for decades, and it has gone on long enough. It is time that the forces that would degrade the environment, that would degrade the Grand Canyon start to compromise.

I would like to close with another quote from Dr. Carothers. "Man now possesses the capability to maintain, restore and even enhance the river of the future via the wise release of water from Glen Canyon Dam. Such a goal is not unreasonable for one of the world's greatest natural treasures. The profound wonder of the Col-

orado River through the Grand Canyon with its ability to humble, heal and illuminate the human experience will be even more important to future generations than it is today."

[The prepared statement of Mr. Elliott follows:]

PREPARED STATEMENT OF ROBERT L. ELLIOTT, VICE PRESIDENT, WESTERN RIVER GUIDES ASSOCIATION

INTRODUCTION

Mr. Chairman and esteemed members of the committee.

My name is Robert Elliott. I am speaking as the Vice President of the Western River Guides Association, as a river concessioner in the Grand Canyon since 1974, and as a Colorado River Guide since 1965. I am honored to be given the opportunity to speak with you today.

The Colorado River through the Grand Canyon is my second home; one of my greatest joys has been introducing people to its depth and wonder for the past 25 years. One of my greatest pains has been to witness its destruction.

WHAT'S THE PROBLEM?

When I first started guiding in the mid-60's there were wide, expansive beaches in most parts of the Canyon. Most of these beaches have been reduced to half or less of their former size. Many of the camps have been entirely eliminated. Zoroaster, Shady Grove, Elves Chasm, other beaches come to mind.

"Many of the good things that happen on a river trip happen on beaches," says one of my fellow outfitters [Gaylord Staveley]. "You can't make camp without them. You can't sleep on the rocks. You can't sleep standing against a tree."

But we've lost more than sand. Along with the beaches go riparian ecosystems, backwater nurseries for native fish and fragile marsh habitats. With each day of fluctuating flows the river loses a bit more of its resilience and its ability to bounce back from man and nature's impact on it.

Through maximization of peaking power production at Glen Canyon Dam we have greatly enhanced the power of the Colorado River as an erosional agent. You are likely familiar with the Glen Canyon Environmental Studies Final Report of January, 1988 and its conclusions that "there are substantial adverse effects on downstream environmental and recreation resources . . . and that modified operations could protect or enhance most resources."

My personal experience over the past 25 years supports these same conclusions: we have a serious problem in our showcase National Park, the Grand Canyon, due to the present and continuing operations of Glen Canyon Dam.

HOW DID WE ARRIVE AT THIS STATE OF AFFAIRS?

We arrived at this state of affairs, quite simply, through compromise and neglect. Glen Canyon was understood, or so we thought, as a necessary sacrifice. But we failed to ask what the impacts would be on the Grand canyon.

Unbelievably, the primacy of power has been advanced in practice even without primacy under the law.

"Flexibility has been carefully built into every step of the power production process save one," says Dr. Steven Carothers, the co-author of a book soon to be released on the bio-political management of the Colorado River. ". . . the power contracts are rigid, long-term economic commitments that essentially demand selectively maximized power production power contracts of 15 years duration rehiring guaranteed amounts or power over a period of time with an incalculable number of unforeseen variables.

"Much of the uncertainty inherent in long-term power contracts has been eliminated by ignoring the [need to] provide for recreation and to maintain the environment."

Dr. Carothers makes a compelling point that inflexible power contracts have been accommodated within a system which demands flexibility only by ignoring the environment . . . a sad indictment of our times. How often this scenario has been played out across our land only the sacrificial lamb in this case is the Grand Canyon.

Now we are at least asking the right questions.

After a decade of unfilled promises to study the environmental effects of Glen Canyon Dam, the Bureau of Reclamation has begun an environmental impact statement . . . brought about, however, only through extraordinary pressure from the public, the courts, and Congress. We owe much gratitude to you, Mr. Chairman, and

Senators McCain and DeConcini for helping apply the pressure when and where it was needed.

MERITS AND AMENDMENTS TO THE LEGISLATION

Grand Canyon National Park and Glen Canyon National Recreation Area desperately needs the protection afforded by the subject legislation. It is brilliantly conceived and framed. It presumes correctly that the Secretary of the Interior will not of his own volition take emergency corrective action to protect environmental and recreational resources downstream from Glen Canyon Dam. The Secretary has had the evidence, the legal mandate and the opportunity to act responsibly to protect the resources in the Grand Canyon for years. Through lack of courage, vision, and leadership, he has failed to provide such protection.

Protection for the Grand Canyon without changing C.R.S.P.

The genius of this bill is that it simply directs the Secretary to operate Glen Canyon Dam "in such a manner as to protect, mitigate adverse impacts to, and improve the conditions of the natural resources of the Grand Canyon National Park and Glen Canyon National Recreation Area," without altering the Colorado River Storage Project Act [the "Law of the River."]

The "law of the river" does not need to be tampered with to achieve the protection we seek for the Grand Canyon and Glen Canyon National Recreation Area. This bill contains no threat to the Colorado River basin compact or the water allocation process, and it should not. The basin states need flexibility to protect their water delivery commitments. They apparently fear that the optimal environmental and recreational release pattern might require a steady flow with seasonal adjustments and thus demand inflexible monthly discharge patterns.

This would not be the case under this bill. The priority of water delivery is clearly maintained. What this bill properly calls for is reasonable consideration for environmental and recreational values within the operations needed for water resources.

Setting of Interim Flows and the Problem of Timing

Another strength of the bill is the provision for setting interim flows. It has been a challenge to arrive at the best possible schedule for implementation of interim flows. My first impression upon reading the draft bill was "this is complex." My second impression was, "It flows logically and makes sense." My third impression was, "They must be frustrated with the Secretary; how can they be so nice to him?"

You're giving the Secretary a lot of the benefit of the doubt when you know he's going to dither until the last minute. You may as well prescribe implementation on September 1, 1991 except that would be a mistake.

Senior Scientist Duncan Patten and other scientists say they have the data to recommend interim flows immediately based on Phase I of the Glen Canyon Environmental Studies. I hate to see any kind of further delay when I see so clearly in my mind's eye the sand eroding away from hundreds of beaches this very minute.

At the very least when referencing scientific data, section 4 should include language that directs the Secretary "to consult with the Bureau of Reclamation's Senior Scientist and the Glen Canyon Environmental Studies technical review teams." In so doing you would force greater accountability on the part of a Secretary who is likely to thwart Congressional intent and put off implementation as long as he can get away with.

Long Term Monitoring

Lastly, I would like to address the requirement that the Secretary implement a program for long term scientific monitoring. "Scientific monitoring" is simply too bland a term to effect what is clearly your intent in this legislation. The data truly necessary to meet the section 3 protection requirement will not be in hand even after the E.I.S. is completed, according to Duncan Patten and other scientists who spoke at a symposium on Glen Canyon Dam operations in Santa Fe at the end of May. Patten says that an ideal research program would last 18 years.

The legislation must insure that the Secretary does far more than just monitor the effects of new power operations of Glen Canyon Dam. The Secretary must actively seek the additional information which will provide the basis for adjusting those operations in the future.

Upon review of the E.I.S. the Secretary will be faced with the great challenge of creating an adaptive management tool that will preserve basic natural and recreational resource values which is supported by a constant improvement in data, analysis, and understanding of how this complex ecosystem functions.

And the Secretary is not up to the assignment. At least he's not up to the assignment without your assistance. Please work with us on strengthening the language under the section which addresses long term monitoring.

IN CONCLUSION

In order to protect the Grand Canyon, priorities have to be reestablished and acted upon. The subject legislation accomplishes this need exceptionally well. Congress is good at setting values and priorities and it requires leadership and courage—traits that Congress is more willing to show than the administration when it comes to environmental values.

Protecting the Grand Canyon is every bit as important as producing hydroelectric power at bargain-basement rates. Poll after poll of the American public shows that people are willing to pay increased rates [user fees, prices, etc.] for environmental protection if necessary.

The Grand Canyon provides a symptom for our times: when it comes to the environment we have been continually compromising for decades and it has gone on long enough. It is time that the forces that would degrade the environment, that would degrade the Grand Canyon, start to compromise.

Let me close with another quote from Dr. Carothers: "Man now possesses the capability to maintain, restore, and even enhance the river of the future via the wise release of water from Glen Canyon Dam. Such a goal is not unreasonable for one of the world's greatest natural treasures. The profound wonder of the Colorado River through the Grand Canyon, with its ability to humble, heal, and illuminate the human experience through a vibrant encounter with the natural world, will be even more important to future generations than it is today."

Thank you.

Senator BRADLEY. Thank you very much, Mr. Elliott, for your testimony.

Mr. Litton.

STATEMENT OF MARTIN LITTON, RIVER GUIDE, PORTOLA VALLEY, CA

Mr. LITTON. Thank you, Senator Bradley.

I hope you will find time to read my written testimony because I am not going to——

Senator BRADLEY. Your full testimony will be in the record, and I will promise you that I will read it. If you could just share with us a summary, that would be appreciated.

Mr. LITTON. Just briefly.

I first floated the Colorado River in the Grand Canyon in 1951, and I have taken small row boats through it since then at least 80 times. And so, if that has led me to any kind of expertise, the one thing that comes out of it is that Glen Canyon Dam did not enhance river running in the Grand Canyon. That is a misconception that is being built on and built on, and the assumption is that if you say it, it is true. It is not true.

The damage to Grand Canyon from Glen Canyon Dam began not when the dam was closed, but when it was under construction and the river was diverted and cement was dumped in the river to leave stains in the Grand Canyon on the walls that are still there. And so, we go back a long way with this damage, and it is continuing right as we sit here today.

We have studies, tests, research, environmental impact statements, the preparation of which will stall anything that you are going to do. It seems to me that stalling tactics are the order of the day. All of these things really lead to conclusions that we already have. We know what the problems are. We do not have to restudy

them to death. And it worries me about an environmental impact statement which will identify impacts that are obvious.

The thing that bothers me about the bill—and I think it is easy to fix—is that it is not specific in what should be done at Glen Canyon Dam in order to fix the problem, and it could be. The problem is really a very simple one. Today's problem is the fact that the water fluctuates coming out of Glen Canyon Dam ordinarily every day, and it is cold. I will not go into the cold end of it because there are ways described in my text there of protecting the warm water fish merely by flattening out the flow, allowing them to go into tributaries where they will not be flooded out, where they will not be left high and dry if the flow is even.

The way to stop the fluctuating is to stop the fluctuating. The river must flow at a steady rate adjusted only seasonally and gradually with a high of about 18,000 cubic feet per second, between 17,500 and 18,000, about the first of July and a low of about 5,000 cubic feet per second about the first of January. Between those dates, there would be a curve which would more or less simulate the natural flow of the river, although it could not go to the extremes that prevailed at times before because the dam will not accommodate that. And, of course, we do want to squeeze all the watts out of the system that are possible.

So, in order to use the power plant fully—and remember that the big reservoir back there can regulate the river in times of flood, in times of shortage. Unfortunately it did not because in 1983 the proper means were not used to determine what was going to come.

Now, in steadying the flow, we cannot put back what is lost. 80 to 85 percent of the beach is gone. I do not mean just the beaches. I mean the riparian zone, the life of that zone, the banks, the vegetation, everything.

Senator BRADLEY. And you have seen that.

Mr. LITTON. Yes, sir. Do you have the pictures? Did the young lady give you the 10 envelopes?

Senator BRADLEY. Yes.

Mr. LITTON. That is a place on the river an average day, an average camp, and it is in the morning, and the river is going down. And you see that as the water comes out of the banks where it has soaked in during the high flow, it is bringing the banks with it down into the river. Not only is the water actually coming out and gullying the banks as it flows through, but the bank is so soft, that as it is undermined like that, it behaves almost like a glacier. It moves and flows, cracks, and then collapses. And this goes on every day, not just when we are photographing it or watching it, but every day of the year this continues. And it is a wonder we have any beaches left. That is all I can say about that.

Now, the evening of the flow that I have mentioned will raise a question and a problem, not a big problem, and it does not have to be a problem at all. I have researched something. I have researched it with the Bureau of Reclamation. The answer is to move the peaking power, if you want peaking power, to Hoover Dam. There is no physical impediment to doing that.

The quickest way to explain why it has not been done or has not been considered is a conversation between me and David Crandall, the former regional director of the Bureau of Reclamation in Salt

Lake City, a gentleman whom I respect who is now retired. I said why do not we do it at Hoover Dam. And he said, well, if we did not, Boulder City would get the credit. It would go into the lower basin account, and Glen Canyon Dam would not look nearly as good on the balance sheet because it would not be the same kind of cash register, but we would still get the same peaking. We would still serve America just as well or better than it is being served by Glen Canyon Dam's peaking power. Hoover has the capacity. Downstream effects would be nil because Hoover Dam empties into Lake Mohave, a large reservoir which could not be impacted by daily rise and fall of the river.

And I think that ought to be in this bill that that is the way to go. It is a short-term remedy. It could be done quickly. There might have to be some change in transmission capacity moving lines from Glen Canyon power plant to the Lake Mead power plant, but that is a simple matter compared to all of the things we are going through trying to save the Grand Canyon by modification, by a little bit of everything upstream. And I do not really know how we propose to help it or save it. Nothing has been said. Well, we will modify this, we will fix that, we will do better. How are you going to do better and still have peaking? You can have peaking at Hoover and get it over with and have the river restored to something of its majesty and wonder and beauty in the Grand Canyon.

I think that is all I need to say. Thank you.

[The prepared statement of Mr. Litton follows:]

PREPARED STATEMENT OF MARTIN LITTON, PORTOLA VALLEY, CA, ON S. 2807

I am Martin Litton, of Bear Gulch Drive, Portola Valley, California 94028. My personal acquaintance with the Grand Canyon of the Colorado River began in the Canyon in 1939 and I began floating the Colorado River in the Canyon in 1951. I founded Grand Canyon Dories, a commercial river company, and since 1955 I have rowed all the way through the Canyon at least eighty times. As an author and editor, I have participated in the publishing of books, articles, and papers on the subjects of the Grand Canyon and the entire Colorado River watershed, and I have taken part in the production of several motion pictures and television programs dealing with the Grand Canyon and the Colorado Plateau.

I have been involved for more than 15 years in efforts to persuade the Bureau of Reclamation to alter its operating regime for Glen Canyon Dam. In 1974, Grand Canyon Dories sued the Commissioner of Reclamation over the operation of Glen Canyon Dam which unlawfully backed the water of Lake Powell into Rainbow Bridge National Monument. In 1982, my testimony before the House Subcommittee on National Parks and Public Lands, a copy of which I have attached to today's testimony, recommended that Congress mandate specific flows through Glen Canyon Dam every day of the year. I still believe in the merit of that proposal, although the legislation you have before you, depending on the version finally enacted, may diminish the need for it.

This is a red-letter day for me, as it must be for most of us here. Not many years ago, it would have been next to unthinkable for both of the Senators from Arizona to do for the integrity of the Grand Canyon what Senators McCain and DeConcini propose to do with this legislation: reflect the true will of the people of the United States as to the importance of one of our greatest national parks.

There can be no doubt that you have an overwhelming majority of the American people supporting you. If we could only lift this issue out of here today and place it before an informed electorate, how quickly the public would settle the matter of "primacy" between the Grand Canyon and peaking-power convenience!

Since Glen Canyon Dam went into operation, I have carefully observed the effects that water releases for peaking power have wrought on the river's riparian zone (including sand beaches) throughout the Canyon.

By far the greater part of the material of which the banks and beaches were composed before 1963 is now gone.

The principal reason for this depletion is not the occasional occurrence of high volume in the river over sustained periods (there has been only one such period, in 1983, during which the dam did not contain the flow) The cause of degradation is the more insidious, more subtle, less noticed daily rise and fall of water caused by peaking power operations.

Thus, on most days of the year, the banks and beaches are soaked, to become soft and heavy and weakened. Then the level of the water is lowered at a rapid and extremely unnatural rate, so that the water inside the banks (which has been transformed into a mushy goo) rushes out and down into the river, making newly eroded gullies every time, into which the wet upper levels of the banks collapse under the simple force of gravity. The attached photographs, of an "average" situation, illustrate the process which has occurred almost every day for 27 years.

Anyone passing along the river can observe this process and its effects at any time. Unlike the former annual ebb and flow, the daily tide allows no opportunity for the banks to be stabilized through natural processes. The cracking, sagging and slumping of the banks, with the consequent steady creeping of the lost material into the bed of the river to be carried downstream, is not violent or spectacular, but it is by far the major factor in the loss of beaches and of plant and animal riparian habitat.

And let no one tell you that habitat in the riparian zone has been "improved" by Glen Canyon Dam. Impenetrable tangles of exotic tamarisk are hardly a substitute for delicate riverside dunes decorated with evening primrose and sand verbena and all the varied crisscrossing little tracks in the sand telling—in the morning's first light—the drama of the night before.

The history of the problem may be complex, and the reasons and motivations behind it may be equally complicated, but the problem itself is simple to describe. It consists of the fluctuating releases of water from Glen Canyon Dam, and that problem will not be significantly mitigated by anything short of steady seasonal flows, with no discernible daily variations.

While there may be nothing immediately possible to provide mitigation for the coldness of the water, steady flows alone can save warm-water fishes whose only refuges are the warmer tributaries, by allowing them to find tributary spawning beds that will neither be overwhelmed by intruding cold water nor left high and dry when the damming effect of the river declines with the onset of the daily "low".

If the Grand Canyon is to be as "saved" as it ever can be in foreseeable time, you have no option but to eliminate all daily fluctuations in releases from Glen Canyon Dam except for the progressive changes—surely of not more than 100 cubic feet per second per day, up or down as needed to go from one season to another. (Bottom of the curve, January 1, should be 5,000 cfs, and the top, July 1, should be just under 18,000 cfs.)

Just as the problem and the means of correction at Glen Canyon are obvious and physically, if not politically, simple, so is replacement of the "lost" peaking power.

Although peaking can be obtained by a variety of other means, I do not argue that they are better or cheaper than turning on the faucet. I have investigated the matter with responsible authorities in the Bureau of Reclamation, who have frankly confirmed my belief that Hoover Dam is where "Glen Canyon's peaking" should have been coming from all along.

The insistence on peaking at Glen Canyon Dam is little more than an attempt to make it appear to be a better "cash register" than it is or needs to be.

Lake Mead has the water (and gets all that comes down the Grand Canyon, less the inevitable evaporation) and Hoover Dam has the capacity. Remove the interregional jealousies—certainly a small price to pay for a truly living Grand Canyon—and Lake Mohave will handily receive Hoover's surges without feeling them at all.

These ends can be achieved, and quickly, by the very law you are now contemplating. The possibly necessary shift of some transmission capacity from Glen Canyon to Hoover is a simple matter when compared to the other tasks that have been considered. If the law specifically requires complete (never discretionary) smoothing of the river's flows through the Grand Canyon, one might be surprised at how quickly any objections to the known-to-be more cost-effective peaking-power production at Hoover Dam will fade away.

Mr. David Crandall, former Regional Director of the Bureau of Reclamation in Salt Lake City, acknowledged to me that there was no peaking-power function at Glen Canyon that could not be performed as well or better at Hoover. When I asked him why that function should not be transferred there, he replied, "Because then Boulder City would get the credit. Revenues would go into the Lower Basin Account, and our Region wouldn't benefit." I appreciated his candor. But it is clear that although the river's water always comes from the same sources and ends up in

the same places, the fate of the Grand Canyon, at least up till now, has rested not so much with engineers as with accountants, when in truth it should have rested with neither.

I think the Congress of the United States can and should deal with this problem now. The Grand Canyon Protection Act of 1990, when passed, may bring good sense not only to the way we treat the most celebrated natural wonder of this planet, but also to the manner in which we develop (or better yet, don't develop) that much of our birthright which yet remains unsullied and pure.

And it should be remembered that without peaking, Glen Canyon will still serve as a full-time facility, squeezing every watt and every drop of water out of the river and putting it all to beneficial use.

There is no longer any question as to what is wrong in the Grand Canyon, or as to the remedy, yet studies breed more studies and the clearly understood environmental impacts are ignored while the preparation of an Environmental Impact Statement serves as a device to stall corrective action. And every day the degradation continues.

We have new hopes of stopping that, and even of gradual restoration of the resource, with the enactment of the Grand Canyon Protection Act of 1990.

PREPARED STATEMENT OF MARTIN LITTON, PRESIDENT OF THE FEDERATION OF
WESTERN OUTDOOR CLUBS

I am Martin Litton, President of the Federation of Western Outdoor Clubs, which is a federation of 42 organizations with an aggregate membership of approximately 300,000 persons.

Our position is that relatively short-term issues such as superficial upkeep, "development," and the presence or absence of visitor facilities are not the most pressing problems facing the national parks. These issues are rather easily addressed when compared to the long-range specters of insufficient physical area to withstand future visitor impact, of boundaries inadequate to provide for a measure of ecological integrity, and of a national park system poorly shielded by the Interior Department against external threats, some of them from within the Department itself.

In view of the limited time today, I shall address just one of those issues—the plight of the Colorado River in Grand Canyon National Park.

The life artery—indeed, the very architect—of the most celebrated natural feature of this planet is being methodically, capriciously, needlessly destroyed by the Interior Department's Bureau of Reclamation at the direction of the Western Area Power Administration in direct contravention of the spirit if not the letter of national park law. The issue is "peaking-power" generation, whereby water released through Glen Canyon Dam surges crazily through the Grand Canyon at volumes which commonly range between 3,000 and 25,000 cubic feet per second in a 24-hour period and may actually go from 1,000 cfs to 32,000 cfs and back again in the course of a single day.

Without having observed the river's patterns in the Canyon for a period of 30 years, as I have, one might find it difficult to comprehend the extent of the devastation. The ongoing effects and the prospects for the future have been described by scientific authorities in various fields, but if you remember the ever-so-gradual rise and ebb of the undammed river from season to season, the vistas along the stream as it coursed majestically around and past the succession of broad beaches swept clean and clear of foreign plants by the annual tide, the shade of vigorous stands of thick-boled honey mesquite thriving along the upper limit of that once-a-year irrigation, resident Canada geese taking their downy goslings for that first swim away from the security of those anchored nests afloat on the steady current, the human voyagers confident in the knowledge that the level of the next day's river would not vary more than an inch or two from that of yesterday's—if you remember these things and more, some of the present appraisals of the effects of operational methods at Glen Canyon Dam must seem weak and timid indeed.

In the past quarter-century the Congress has consistently defended elements of the national park system against the construction of new major dams within their borders. Teamed with intermountain senators and representatives, the Bureau of Reclamation and its one-time overseer, former Secretary of the Interior Douglas McKay, affirmed flatly that there could be no development of the Upper Colorado River Basin, and no implementation of the Colorado River compact among the states, without the erection and operation of Echo Park Dam, in Dinosaur National Monument. Congress did not believe that, and eliminated Echo Park Dam once and for all.

Again, the Bureau of Reclamation pressed for two dams—so-called Marble and Bridge Canyon, or Hualapai—in the Grand Canyon, as essential to full utilization of the Colorado. Congress—including, eventually, some of the Arizona members who had endorsed the idea—did not believe that either, and showed its distrust of dammers by placing both damsites in Grand Canyon National Park.

Now we are faced with a different sort of problem, one which we should have anticipated but did not. Most concerns about dams have been related to upstream effects—what would be lost by inundation. We could readily point out what would be drowned under reservoirs hundreds of feet deep above Echo Park and the proposed Grand Canyon dams. (Not much was done to save Glen Canyon from flooding, partly because it did not have the automatic constituency enjoyed by national parks.) We could point to the horrible example of Ketch Hetchy and elicit, worldwide, a resounding "Never again!" We knew how Hoover Dam had flooded the lower 40 miles of the Grand Canyon; but until Glen Canyon Dam was closed in 1964 we gave little thought to what the operation of the power plant might do to the entire 277 miles of the Canyon downstream from it.

No harm was seen in the promise that Glen Canyon Dam would tend to steady the flow of the river, would extend the season of river travel, and so on. That promise, however, proved to be empty. Over the ensuing years, the Bureau of Reclamation has increasingly perceived itself to have obligations to provide "benefits" to just about anything and everything except Grand Canyon National Park and the public which may be inspired by it. Although this agency likes to call itself "a water company, not a power company," it attempts to justify its existence with power revenues, hence its emphasis on "peaking power," which commands a higher price from the purchasing utility than "base load," a steady flow of energy.

Obviously, there is no way to get more power out of the Colorado River at Glen Canyon than is already being generated there. In fact, the present generators have nearly three times as much capacity as can be utilized; in other words, the full, steady flow of a river with more than double the volume of the Colorado would easily be accommodated by Glen Canyon's turbines, each of which presently stands idle more than half of the time because there is not the water to turn them without depleting Lake Powell. Actually, almost two-thirds of the generating capacity of Glen Canyon Dam could be removed permanently without the loss of so much as a kilowatt in an entire year's operation, if Glen Canyon Dam were used solely as a base-load plant.

Still, the Bureau came up with the idea of adding capacity to the present plant by installing two extra generators in the old bypass tunnels. The purpose was to increase revenue to the government with the sale of more of the higher-priced peaking power. After much public disapproval was expressed, and the Bureau's supporting figures shown to have been full of errors anyway, Interior's rationale for abandoning the project was "to help the President meet his budget goals!"

Without the scrutiny aroused by that outrageous proposal, we the people might not have examined other ongoing schemes—such as rewinding the present generators to accommodate higher peaks (and of course lower and longer "valleys").

We might not have been sufficiently alarmed at the creeping turnaround emerging in the established pattern of mismanagement of the river. The normal flows of the Colorado were high in spring and summer and low—once as low as 700 cubic feet per second—in autumn and winter. Confirming a trend that has already begun, the Bureau's published forecasts for future flows must shock everyone who has any regard for the Grand Canyon: Two of the months of naturally high flows—May and June—are already being deprived of most of their river and are slated to remain among the months of lowest volumes, because the Bureau of Reclamation perceives its new political "obligation" to be the heating of prospective oil-shale towns with electricity generated by dropping Lake Powell through Glen Canyon Dam at about three times the volume now proposed for spring and early summer!

Although attached Exhibit A will show that supposedly anticipated demands are largely fictitious or imaginary, we are more concerned with the way things are than the way they might be in 2000 or 2020 if Burec's claimed clairvoyance is to be believed. The Bureau says peaking power is needed, and we will not argue the point. But it is not needed at Glen Canyon Dam. It can be obtained at Hoover Dam with no perceptible effect on artificial Lake Mojave, immediately downstream. It can be obtained by load management throughout the present system. And while BuRec speaks of 12 to 24 hours to bring thermal power on line, the large utility companies that peak with it every day speak of 30 to 40 minutes.

Although the economies in numbers of operating personnel at a base-load hydro-power plant have not been brought into the picture, we are willing to concede that some sacrifice of net revenue could result from making Glen Canyon Dam's releases

more compatible with the purposes for which Grand Canyon National Park exists. But sacrifices must be made on one side or the other or both, and too much of the Grand Canyon's integrity has been sacrificed already. We may well ask which is the more important—a mere convenience to the Western Area Power Administration and the Bureau of Reclamation and their associates, or the future of not only the Grand Canyon but our entire national park ethic.

The time has come for the Congress to set appropriate standards with landmark legislation. Specific flows of the Colorado River into the Grand Canyon must be ordered by law. The Bureau of Reclamation can adjust its affairs around statutory flows as shown below—certainly more easily than it has had to readjust its thinking to the complete losses of favorite projects to which it had tied its long-term planning. Flows moderated to save the Grand Canyon experience will not return the river to its natural condition, but will afford a nearer-to-natural aspect consistent with full utilization of the Glen Canyon power plant while providing for substantial winter flows not only for power generation but for other uses of the river, including that of trout spawning, which depends on a 90-day period of steady flow. These figures, which set certain specific limits, still have ample flexibility built into them to accommodate extraordinary circumstances. They have been worked out with the cooperation of a number of interested parties, including the Arizona Department of Game and Fish and the Western River Guides Association, as well as Friends of the River and the River Defense Fund of the American Wilderness Alliance. They are adopted by the Organizing Committee of the Trust for the Grand Canyon, now in the process of incorporation.

We do not demand a natural river in the Grand Canyon, but we Americans have already yielded up too much of our heritage; this is the ultimate compromise:

MONTHLY DIVISIONS OF THE COLORADO RIVER ENTERING THE LOWER BASIN THROUGH GRAND CANYON NATIONAL PARK, TO DELIVER TO THE LOWER BASIN NOT LESS THAN 8.25 MILLION ACRE-FEET PER YEAR, AVERAGED IN TEN-YEAR INCREMENTS AS REQUIRED BY LAW

January—Not more than 5,000 cfs, to yield approximately 305,753 af
 February*—Not more than 5,000 cfs, to yield approximately 276,161 af
 March—Not more than 5,000 cfs, to yield approximately 305,753 af
 April—Not less than 14,811 cfs, to yield approximately 875,670 af
 May—Not less than 16,456 cfs, to yield approximately 1,004,372 af
 June—Not less than 16,667 cfs, to yield approximately 9a6,300 af
 July—Not less than 16,667 cfs, to yield approximately 1,019,177 af
 August—Not less than 16,667 cfs, to yield approximately 1,019,177 af
 September—Not less than 16,456 cfs, to yield approximately 973,972 af
 October—Not less than 14,811 cfs, to yield approximately 904,520 af
 November—Not more than 5,000 cfs, to yield approximately 292,624 af
 December—Not more than 5,000 cfs, to yield approximately 305,753 af

* Slightly lower cfs in leap years

The bill to enact this proposal into law will meet some objections; we ask you to consider the demonstrated credibility of the objectors. You will be told that under the constraints imposed here, contractual obligations to customers cannot be met; we ask you to examine the propriety of the contracts. The Bureau of Reclamation will claim that efficient operation of Glen Canyon Dam as a base-load facility under the mandatory guidelines indicated is impossible; we ask you to remember who claimed that development of the Colorado River would be impossible without Echo Park Dam.

Senator BRADLEY. Mr. Litton, let me thank you very much for your testimony. It is always the voice of experience, the person who has been there, the person who has seen things over time, the person who has an obvious understanding and caring for his subject that is the effective witness, and you have been that today, let me assure you.

Mr. LITTON. Thank you, sir.

Senator BRADLEY. Let me ask Mr. Norton just a couple of questions, maybe one to each of you, and then we have to move on.

What measures do you think the EIS should consider to remedy the dam's adverse environmental impact?

Mr. NORTON. I think, Senator Bradley, that the EIS has to look at a range of alternatives, but the primary alternatives that the EIS ought to address are changes in dam operations. And those changes are the raising of minimum flows, the lowering of maximum flows, changes in the so-called ramping rate, the rate of change between the high and low flows, and as Mr. Litton testified, the evening out, so that we have higher, steadier flows that are seasonally adjusted. Those are the primary kinds of alternatives that the EIS ought to look at.

Senator BRADLEY. Are you familiar with WAPA's legal opinion that views power production as the project purpose that is superior to all others?

Mr. NORTON. I am very familiar.

Senator BRADLEY. And what is your view as a lawyer?

Mr. NORTON. I think it is dead wrong and I do not think it is supported by any reading of either the Colorado River Storage project, laws going back to the National Parks Organic Act of 1916, laws that were passed subsequently to the CRSP Act in the 1960's and 1970's, including the Endangered Species Act, the Colorado River Basin Project Act. But nevertheless, the position is there asserted in that opinion, and it has been asserted by Western Area Power Administration continuously, aggressively. It was essentially the position taken by the Department of Justice in the litigation, as I mentioned, and that has been the policy. And I believe that that is the policy that this bill ought to overturn, and I think it does the job.

Senator BRADLEY. Do you think that the Secretary's decision to do an EIS on this particular project sets a precedent for other areas?

Mr. NORTON. I think it does set a precedent. I think it sets an important precedent. I think we ought to look at the impact of the way dams and other facilities are operated.

Senator BRADLEY. Do you think that this EIS is long enough to do the job?

Mr. NORTON. The period of time?

Senator BRADLEY. Yes.

Mr. NORTON. I think it is and I think the period of time provided for in the statute is perfectly adequate. My understanding having talked with some of the people involved including the scientist is that they believe that they can get the job done under the existing schedule and certainly under the schedule provided for in the bill.

Senator BRADLEY. Do you think the environmental community should contribute to the cost of the EIS?

Mr. NORTON. No.

Senator BRADLEY. Any of the remedial measures, if any?

Mr. NORTON. Any remedial measures?

Senator BRADLEY. Yes.

Mr. NORTON. In what sense?

Senator BRADLEY. Say there is an EIS and maybe it comes forward with some remedial measures. Do you think then there should be any kind of cost sharing?

Mr. NORTON. I think it depends upon what those are. I think that the primary focus of the EIS and the measures ought to be, as I said, changes in the way the dam is operated. I think that other

kinds of alternatives, structural alternative, rip-rapping beaches in the Grand Canyon are ones that only should be looked at as a last resort.

Senator BRADLEY. Are you familiar with the Northwest Power Planning Act?

Mr. NORTON. I am.

Senator BRADLEY. Do you think that it provides an example of the type of consultative forum required to balance environmental and power interests?

Mr. NORTON. I think it does. I am not sure that at this stage I would be prepared to say that that experience can be transposed into the Colorado River Basin, but I think that that is certainly a possibility over the long term that we should explore.

Senator BRADLEY. Let me ask Mr. Echeverria, if I could. Do you think the law of the river is insulated from Federal environmental laws?

Mr. ECHEVERRIA. No, I do not think it is.

Senator BRADLEY. So, you agree with Mr. Underwood. Everyone on this panel today has said basically the law of the river is not insulated from environmental laws.

Mr. ECHEVERRIA. I do not think that this hearing addresses whether the Department has the authority to protect the Grand Canyon in accordance with NEPA. The question is are they doing so and do they need direction from Congress in order to carry out the mandate.

Senator BRADLEY. Mr. Elliott, let me ask you. Do you think that recreational use of the river adversely impacts the river's environment?

Mr. ELLIOTT. I think that it has some kind of impact on the environment for sure. I think that the extent of that impact is not known a great deal. The Park Service throughout the years has had to look at any kind of impact the recreation use has had on the environment, and as I believe was addressed by some of the administration witnesses this morning, they have taken considerable steps to mitigate those impacts through preventing multiple trailing, keeping everybody to the same trails and hauling out all human waste, human effluent, and debris. In fact, all of our river customers on our trips are just amazed at how clean the canyon looks.

Senator BRADLEY. Mr. Litton, you said you went down the Colorado first how long ago?

Mr. LITTON. 1951, sir. I went all the way through for the first time rowing my own boat in 1955.

Senator BRADLEY. So, you were there before Glen Canyon.

Mr. LITTON. Oh, yes, several trips.

Senator BRADLEY. So, what time of the year did you go down the river?

Mr. LITTON. There were few people going in those days, so you could never be crowded no matter what you did. We would pick generally early July because the river was declining gradually at that time.

Senator BRADLEY. One of the most astounding numbers that I have come across in this whole deliberation is that flood flows in

the river prior to Glen Canyon Dam may have peaked at 300,000 cubic feet a second.

Mr. LITTON. That has never happened in historic times. That is only an assumption. It has never been measured at that.

Senator BRADLEY. It has never been actually measured at that rate?

Mr. LITTON. No, sir.

Senator BRADLEY. What would you say was the high point? What was the flow prior to the dam?

Mr. LITTON. I think there is a record of something in the neighborhood of 200,000.

Senator BRADLEY. Okay, it still makes the point.

Mr. LITTON. 127,000 in my experience made it excellent river running, by the way.

[Laughter.]

Senator BRADLEY. You did not have to worry about the rocks.

Mr. LITTON. No, sir, and you really went nice.

[Laughter.]

Senator BRADLEY. The point is here we are talking about flows. You say 18,000 cubic feet a second when the canyon was really created by flows of 200,000 plus cubic feet a second. It makes you realize the difference between the canyon that was always there and the canyon that is there now.

Mr. LITTON. Yes.

Senator BRADLEY. And it gives us pause to consider not only that we do not want further degradation, but also how much the natural setting has already been altered by our decisions. I was struck by that when I heard you testify as well as when I heard Secretary Udall testify in terms of man's presumption in being able to alter the power of natural circumstance. And we are dealing with our ability to affect it around the edges here. The fact of the matter is that we have gone from 200,000 plus cubic feet a second to 31,000 as the maximum.

Mr. LITTON. Because of the dam, of course.

And I gave a figure of 18,000, let us say, as a maximum to be sustained for a short time, but not for very long during the year. And the reason for that, of course, is that there is not the water. If you are going to use the power plant constantly, there is not the water to run it higher. 25,000 or 30,000 would be fine, but on the other hand, with the clear water that the dam has created, the higher water does reach higher into the banks and take more of the material away.

Senator BRADLEY. All right. Let me thank the panel very much for your testimony. It is very helpful.

Our next panel consists of J. William McDonald, Director, Colorado Water Conservation Board, and William Plummer, director Arizona Department of Water Resources. Welcome to the subcommittee. You may proceed. If you could, limit your testimony to 5 minutes so that we can get to the other panel.

Mr. McDonald.

STATEMENT OF J. WILLIAM McDONALD, DIRECTOR, COLORADO
WATER CONSERVATION BOARD, DENVER, CO

Mr. McDONALD. Yes, sir. Thank you very much.

My name is Bill McDonald. I am Director of——

Senator BRADLEY. Your full statement will be submitted to the record, if you would like to summarize.

Mr. McDONALD. Fine. I would be more than pleased to.

My name is Bill McDonald. I am Director of the Colorado Water Conservation Board. Appearing with me today is Mr. N.W. Plummer who is Executive Director of the Arizona Department of Water Resources. The two of us are our States' Governors' representatives for Colorado River reservoir operations, and we testify today on behalf of the other five Basin States' Governors' representatives, as well as the Upper Colorado River Commission.

It goes without saying that the Glen and Grand Canyons are national assets deserving of proper management and protection. The Secretary's decision in this regard to perform an EIS has our support, and it certainly appropriate that this committee make inquiry into these issues.

We understand the issues to be before the committee to essentially be threefold: the conduct and performance of the EIS; the question of changing power operations at Glen Canyon Dam both on an interim basis and after the EIS in the long run; and thirdly, the question of flood releases by which I mean spills, which is the technical term of art used in the statute. To laymen that means releases in excess of power plant capacity at Glen Canyon Dam.

Briefly it is the view of the States that the Secretary has the authority to address each of these issues. He is proceeding to do so by having announced the conduct of the EIS, performing the test flow program, his announcement to conduct interim flows. And we do not doubt his authority to make a final change in power plant operations after that. Basically, therefore, we think that the legislation is not needed. That is not to say that these issues are not important. They are important and they deserve to be addressed, but we believe that there is sufficient authority and legislation to do that already.

Our written statement details the concerns that we would have about legislation were it to move forward. I will not try to summarize those here. I will let the written statement stand on its own. Let me simply comment on the principal and overriding concern which the seven States have relative to water storage and delivery for compact purposes.

We do not believe that it is or should be the intent of this bill to alter Glen Canyon Dam's primary purpose of storing and releasing water for compact purposes. Rather, this bill we understand to be directed at the daily fluctuations in releases that are caused by the power plant operations. That is a distinction in the bill which we think is critical and important.

With respect to power plant operations, let me simply say that restrictions on those operations, which basically are within-the-month fluctuations, daily, and weekly fluctuations—restrictions on those fluctuations and restrictions on minimum and maximum flows are of concern from the States' perspective only if those re-

strictions interfere with the total volumes of water that are to be moved through the system on monthly and annual bases.

Water delivery requirements pursuant to the interstate compacts, the release and storage of water pursuant to section 602 of the Colorado River Basin Project Act of 1968 and the coordinated, long-range operating criteria which have been promulgated pursuant thereto, must not in our opinion be changed or affected in any way by this bill.

Put another way, Glen Canyon Dam's monthly and annual reservoir operations for compact purposes must continue to take precedence over power operations, as we believe is now clearly provided for by section 1 of the Colorado River Storage Project Act of 1956 and by section 602(c) of the 1968 act, and likewise must continue to take precedence over the so-called flood releases, which we again believe is already provided for by current law, section 602(a)(3) of the 1968 act.

In that regard, our principal concern is that section 3 of the bill is confusing in that it seemingly addresses all operations at Glen Canyon Dam, not just power plant operations, this despite the fact that sections 4 and 5(b) clearly call of the implementation of power operating criteria in the interim in section 4 and the long run in section 5(b). It is power plant operations in our judgment, not monthly and annual reservoir operations, to which the bill should be addressed. I would note that even if section 3 were amended to refer to the power plant at Glen Canyon Dam, we believe that section 3 would still leave some ambiguity in that it effectively amends section 7 of the 1956 act without saying so.

We would urge, as a contrary approach, that section 3 of the bill be deleted as it is and replaced with language that directly and specifically amend section 7 of the 1956 act. That is the issue—the opinion of the Office of General Counsel, Department of Energy, to which others have referred is the opinion that has raised that issue, and it seems to us it might as well be addressed directly.

Let me conclude with a couple of quick observations about the issue of flood releases. It is important to understand that determinations about making flood releases are inextricably a part of the release and storage decisions required for compact purposes. The two cannot be untangled from each other. They are one and the same.

In that regard, adjustments were made in annual reservoir operations starting in water year 1987 which reduced the probability that sustained releases in excess of power plant capacity would need to be made in the future. I want to emphasize, Senator, that that change in operations has been accommodated within the context of the existing section 602 criteria of the 1968 act and the formal criteria that have been promulgated pursuant to that. The Basin States do not believe that any further changes are necessary, but most importantly, the matter of flood releases can be left to consideration pursuant to those existing criteria if, indeed, it proves desirable to have further adjustments after the EIS is done.

Our suggested amendment of section 3—that is to say, strike it and amend section 7 of the CRSP Act—is needed to ensure that that is the case and that the storage and release of water for compact purposes is not disrupted.

Thank you very much.

Senator BRADLEY. Thank you very much, Mr. McDonald.
Mr. Plummer.

**STATEMENT OF WILLIAM PLUMMER, DIRECTOR, ARIZONA
DEPARTMENT OF WATER RESOURCES, PHOENIX, AZ**

Mr. PLUMMER. Mr. Chairman, Arizona joins the other six basin States with the testimony that Mr. McDonald has presented.

I would like to take this opportunity to focus also on S. 1556, which I noticed was on this agenda, and join with Senators McCain and DeConcini as Arizona's support for that bill, renaming the Salt-Gila Aqueduct on the Central Arizona Project to the Fannin-McFarland Aqueduct.

[The prepared statement of Mr. McDonald and Mr. Plummer follows:]

**PREPARED STATEMENT OF THE SEVEN COLORADO RIVER BASIN STATES GOVERNORS AND
THE UPPER COLORADO RIVER COMMISSION, ON S. 2807**

This statement is submitted on behalf of the seven Colorado River Basin States' governors' representatives for Colorado River reservoir operations (Basin States' representatives) and on behalf of the members of the Upper Colorado River Commission (Commission), which persons are listed on the last page of this statement.

INTRODUCTION

The Grand Canyon National Park and Glen Canyon National Recreation Area are national assets deserving of proper management and protection. In this regard, the Secretary of the Interior's decision to commence the Glen Canyon Dam Environmental Impact Statement (EIS) is appropriate and has our support.

In the House hearings on H.R. 4498, the companion bill to S. 2807, the Secretary testified that he has adequate authority to undertake the EIS and will complete it in a timely manner. Furthermore, the Secretary testified that he would, pending the completion of the EIS process, put interim flows into effect at the conclusion of the on-going test flow program.

The Basin States' representatives and the Commission support the Secretary's position. We also believe that the Secretary has authority under existing law to implement such permanent changes in power operations at Glen Canyon Dam as are found justified based upon the EIS. Subject to and consistent with the Colorado River Compact, the Upper Colorado River Basin Compact, the decree of the U.S. Supreme Court in *Arizona v. California*, the Colorado River Storage Project Act of 1956, the Colorado River Basin Project Act of 1968, and the other laws governing the regulation of the Colorado River, the Secretary can also take steps, as has already been done, to reduce the probability of having to make sustained releases in excess of powerplant capacity (referred to by some as "flood releases").

Under the circumstances, the Basin States' representatives and the Commission do not believe that legislation is needed. Furthermore, we believe that passage of this legislation would set an ill-advised precedent for Congressional involvement in the details of reservoir operations, these being matters better left to the Secretary.

Should legislation nonetheless move forward, we would respectfully request that the following concerns be addressed.

POWER OPERATING CRITERIA—SECTIONS 3 AND 5 (B)

Sections 3 and 5(b) are the two sections of the bill which are of the most interest to the Basin States' representatives and the Commission. Our major concern is that section 3 of the bill, if it moves forward, be amended to make absolutely clear the distinction between new "power operating criteria" and the existing criteria governing the release and storage of water for compact purposes set forth in section 602 of the Colorado River Basin Project Act of 1968 (the 1968 Act).

It is our understanding that this bill is directed at daily fluctuations in releases caused by powerplant operations. We do not believe that it is, or should be, the intent of S. 2807 to alter Glen Canyon Dam's primary purpose of storing and releasing water for compact purposes. This must be made clear in the bill.

The operation of Glen Canyon Dam is essentially a twofold procedure. First, the monthly and annual volumes of water to be stored and released are determined annually based upon water supply considerations, water delivery requirements, and the avoidance of anticipated spills from Lake Powell ("spills" being "flood releases" in excess of powerplant capacity). These determinations, which are set forth in a projected plan of operation each year (the annual operating plan or AOP), are governed by, among other things, the Colorado River Compact, the criteria set forth in section 602 of the 1968 Act, and the "Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs" (the Coordinated, Long-Range Operating Criteria) promulgated by the Secretary of the Interior in 1970 pursuant to section 602(b) of the 1968 Act.

Second, given the monthly volumes of water to be released, within-the-month (i.e., daily and weekly) fluctuations in releases are made in accordance with power generation needs as determined by the Western Area Power Administration. While the operational parameters for fluctuating hydropower releases have been expressly identified (i.e., there currently are prescribed minimum flows, maximum flows, and maximum rates at which releases may be increased or decreased), formal power operating criteria have not been promulgated.

Monthly and annual reservoir operations at Glen Canyon Dam, which are the operations that pertain to the release and storage of water for compact purposes, are the items of critical importance to the Basin States' representatives and the Commission. Restrictions on within-the-month fluctuations for power releases, and on minimum and maximum flows are of concern only if those restrictions interfere with the total volume of water to be released in any given month or year.

Water delivery requirements pursuant to interstate compact, and the release and storage of water pursuant to section 602 of the 1968 Act and the Coordinated, Long-Range Operating Criteria, must not be changed or affected in any way by the bill. That is to say, Glen Canyon Dam's monthly and annual reservoir operations for compact purposes must continue to take precedence over power operations (as is provided for by section 1 of the Colorado River Storage Project Act of 1956 (the 1956 Act) and by section 602(c) of the 1968 Act), and over flood releases (as is provided for by section 602(a)(3) of the 1968 Act).

In this regard, section 3 of the bill is confusing in that it seemingly addresses all operations at Glen Canyon Dam, not just powerplant operations, although section 5(b) calls for the implementation of "power operating criteria." It is powerplant operations, not monthly and annual reservoir operations, which are at issue and to which the bill should be limited. Furthermore, even if amended to refer only to the powerplant, section 3 would still leave some ambiguity in that it effectively amends section 7 of the 1956 Act without saying so.

Consequently, we urge that section 3 of the bill be deleted and replaced with language that specifically amends section 7 of the 1956 Act to provide that the hydroelectric powerplant at Glen Canyon Dam shall not be operated in a manner which has significant adverse effects on the natural resources of Glen and Grand Canyons. This would directly address the issue raised by an April 26, 1988, memorandum of the Office of the General Counsel, Department of Energy, which concluded that:

Section 7 of the [1956] CRSP Act requires that the . . . Glen Canyon powerplant, must be operated at . . . [its] most productive rate—to produce the greatest practicable amount of firm capacity and energy. The only limitations on this requirement are that priority must be given to meeting the allocation of Colorado River waters contained in the compacts and to the delivery of water for irrigation and domestic use, and operations must be consistent with the Boulder Canyon Project Act, the Boulder Canyon Project Adjustment Act. . . . and the Treaty with the United Mexican States. The operation of the dam and powerplant for other purposes such as recreation and conservation must be consistent with the above prerequisites. . . . [Memorandum at p. 5].

With respect to section 5(b), the concluding phrase thereof needs to be reworded to state that "the Secretary shall implement power operating criteria for THE Glen Canyon Dam POWERPLANT that will ensure that *Glen Canyon Dam* (italic omitted) THE POWERPLANT is operated in a manner consistent with SECTION 3 OF this Act." This ensures clarity as to the intent of both sections 3 and 5(b) and makes it clear that the legal standard for the new power operating criteria is section 3 of the bill.

FLOOD RELEASES

With respect to "flood releases" from Glen Canyon Dam, adjustments were made in annual reservoir operations starting in water year 1987 which reduced the probability that sustained releases in excess of powerplant capacity would need to be

made in the future. Formerly, such releases would have been expected to occur in one out of every three to four years. That probability has now been reduced to about one in 20 years by vacating more space in anticipation of the next year's runoff if need be.

This change in annual reservoir operations at Glen Canyon Dam has been accommodated within the context of the existing Coordinated, Long-Range Operating Criteria. While the Basin States' representatives and the Commission do not believe that any further changes are necessary, the matter of flood releases should be left to consideration pursuant to section 602(a)(3) of the 1968 Act and the Coordinated, Long-Range Operating Criteria if further adjustments prove to be desirable. The suggested amendment of section 3 of the bill would accomplish this.

SECTION 5 (A) (1) —THE EIS

The Basin States' representatives and the Commission support preparation of the EIS and have urged that it be accomplished in a scientifically sound manner and as expeditiously as possible. Furthermore, we support the test flow program at Glen Canyon Dam to produce the data and information needed to complete the EIS.

In our opinion, the Secretary has ample authority to conduct the EIS in accordance with the National Environmental Policy Act (NEPA). The EIS must necessarily evaluate all reasonable structural and non-structural alternatives. Likewise, we understand that the costs and benefits of, and trade-offs between, all affected water supply, power, recreational, and environmental resources must be examined in the EIS in accordance with NEPA.

Accordingly, we believe that section 5(a)(1) of the bill properly refrains from legislating the content of the EIS. It is sufficient, as this section does, merely to set a deadline for completion of the EIS. Amendments which would dictate the scope of the EIS or the range of alternatives to be examined would be inappropriate.

SECTION 4—INTERIM POWER OPERATING CRITERIA

In an April 23, 1990, letter to Secretary Lujan, the Basin States' representatives and the Commission recommended that interim power operations be implemented within 90 days after completion of the test flow program based upon the best scientific information available at that time. We have recommended that such interim power operations remain in effect pending the completion of the EIS and the implementation of such permanent changes in power operations as are found to be justified.

Given that the Secretary has announced that he will proceed in this manner, we believe that section 4 of the bill is unnecessary for several reasons. First, the Secretary should be given the opportunity to complete the test flow program and implement interim power operations thereafter. Second, we are concerned that the effort required to make and document the determinations required by section 4(a) and to develop sound interim power operating criteria could divert scientists and other personnel from the immediate tasks at hand. Third, because of the test flow program, releases from the Glen Canyon Dam power plant between now and September 1, 1991, will be at rates prescribed by that program a majority of the time. Given that this legislation could not now become law any sooner than October of 1990, the few remaining intervals of time are inconsequential at this late date. Finally, the test flow program itself constitutes the first phase of interim power operations. Further changes should await the completion of the test flow program.

If section 4 is to remain in the bill, we would offer the following comments about subsection (b):

(1) Strike the words "be designed to" in the preamble to subsection (b).

(2) Reword paragraph (1) to read as follows:

(1) be subject to and consistent with the Colorado River Compact, the Upper Colorado River Basin Compact, the decree of the U.S. Supreme Court in *Arizona v. California*, the Colorado River Storage Project Act of 1956, the Colorado River Basin Project Act of 1968, and the other laws governing regulation of the Colorado River."

(3) Paragraphs (2)-(6) are inconsistent with each other. First, paragraph (2) establishes as an overall standard the minimization of adverse environmental impacts. However, paragraphs (3)-(6) then speak in somewhat different terms, leaving it unclear which paragraph is to apply. This ambiguity could be resolved by the insertion, in lieu of paragraphs (3)-(6), of a new subsection (c) after paragraph (2) to read as follows:

(c) In developing interim power operating criteria, the Secretary shall, to the extent required by section 4(b)(2) and subject to section 4(b)(1), adjust

fluctuating water releases used for the production of peaking hydroelectric power, adjust rates of flow changes for fluctuating flows, adjust minimum flow releases, and adjust maximum flow releases.

There is a further ambiguity between subsections (b)(2) and (f)(1). This arises because the latter subsection refers back to the requirements of section 3, yet section 3 speaks in different terms than does subsection 4(b)(2). Perhaps, it was intended that subsection (f)(1) refer to section 5(a), rather than section 3, which would be appropriate.

Finally, and most importantly, section 4(b)(4), concerning the minimization of flood releases, should be stricken. Flood releases (i.e., releases in excess of power-plant capacity) have nothing to do with power operating criteria. Furthermore, flood releases are already addressed by the existing Coordinated, Long-Range Operating Criteria, as discussed above.

COSTS OF THE EIS—SECTION 5 (D)

We believe that the costs of the EIS should be nonreimbursable Federal costs. Such costs are being incurred in the public interest and should therefore be borne by the general treasury. We have so recommended in our April 23 letter to the Secretary.

In this regard, we approve of section 5(d) of the bill. However, the word "direct" on line 21, page 9, needs to be deleted. That is a term of art in the Bureau of Reclamation which could be interpreted to mean that only a portion of the full costs of the EIS would be nonreimbursable.

FINDINGS—SECTION 2

With respect to finding (5) on page 3 of the bill, we strongly urge that it be deleted. It is not an accurate statement of existing law, nor does it cite all of the laws which govern the regulation of the Colorado River. Furthermore, to try to cite all such laws would raise more issues than it would resolve. Finally, since a finding is not an operative part of an act, deletion of this finding will in no way affect the bill's substantive provisions.

With respect to finding (1), we do not believe, for the reasons explained above, that it is factually correct to state that "current" practices with respect to flood releases are having substantial adverse effects on the Glen and Grand Canyons. It would be accurate to state that past practices with respect to flood releases have had adverse effects.

The Basin States' representatives and the Commission appreciate the opportunity to submit this statement.

Upper Colorado River Commissioners:
 Jack F. Ross, Chairman, United States
 James S. Lochhead, Colorado
 Carl Slingerland, New Mexico
 D. Larry Anderson, Utah
 Gordon W. Fassett, Wyoming

Colorado River Basin States' Representatives:
 N.W. Plummer, Arizona
 Gerald R. Zimmerman, California
 J. William McDonald, Colorado
 Carl Slingerland, New Mexico
 Jack L. Stonehocker, Nevada
 D. Larry Anderson, Utah
 Gordon W. Fassett, Wyoming

Senator BRADLEY. Thank you very much, Mr. Plummer.

Mr. McDonald, thank you for your testimony. You speak on behalf of—

Mr. McDONALD. All seven States.

Senator BRADLEY. All seven States.

And your major problem is you think section 3 does not clarify and is not consistent with the other sections to specify that this should be power here and not water.

Mr. McDONALD. That is our principal concern, yes, sir. We detail that in the written statement.

Senator BRADLEY. Thank you very much for your testimony.

Mr. McDONALD. Thank you very much, Senator.

Senator BRADLEY. Our final panel consists of William H. Clagett, Administrator of Western Area Power Administration; Clifford Barrett, Executive Director, Colorado River Energy Distributors'

Association; Tom Graff, Senior Attorney, Environmental Defense Fund; Marty Kanner, Legislative Representative, American Public Power Association.

Let me welcome all of you to the subcommittee. Why do we not begin with Mr. Clagett?

STATEMENT OF WILLIAM H. CLAGETT, ADMINISTRATOR, WESTERN AREA POWER ADMINISTRATION, DEPARTMENT OF ENERGY

Mr. CLAGETT. Mr. Chairman, thank you very much. I certainly appreciate this opportunity. And I am also interested in the time factor, and I will try to be as quick as I can. I appreciate my statement being included in the record.

Senator BRADLEY. Your full statement will be in the record, and I apologize to all of you that we are now meeting at 1:30, but I have not eaten lunch either.

[Laughter.]

Mr. CLAGETT. Well, I appreciate that.

Mr. Chairman, I want to emphasize and assure the committee that we at Western also believe the Grand Canyon is a national treasure and it should be protected. I am concerned, however, that this bill is premature and unnecessary. Existing legislation, we believe, can do a very good job of protecting the canyon.

There are some misunderstandings, some misperceptions that are not backed up by the studies that are taking place. For example, you heard a little while ago that the marshlands are gone, or have been substantially reduced because of power operations. The studies are showing that the marshlands were pretty well ruined by the floods of 1983 and 1984. There were huge quantities of water that came down during those 2 years that pretty well ruined them. That has nothing to do with power operations.

There is another interesting misunderstanding. We keep talking about peaking power, and the existing CRSP legislation talks about firm power, and there is a difference. And it is very easy to get the wrong impression when it is said that peaking power has priority. Peaking power does not have priority. It is the firm power that we sell which does require some fluctuations in the river.

But I would like to assure the committee also that as damage occurs and can be identified, we believe very strongly that the existing legislation will allow fixing it. I gave you a couple of examples, and we can go on with several more. I think being on the last panel is kind of interesting because it provides an opportunity to provide some facts for some misunderstandings that others have. But I am not going to yield to that temptation.

Senator BRADLEY. You may do that for the record, Mr. Clagett.

Mr. CLAGETT. Thank you, Mr. Chairman.

There is some new interesting data that has come up. EPA has just in the last couple, 3 weeks, written to the Bureau of Reclamation, in response to the scoping efforts that the Bureau has done on its EIS so far. And I find it intriguing that they say that at least 4 more years of study are necessary to have adequate data to come up with an adequate EIS. I am not going to judge whether or not it takes 4 more years or whatever, but I would suggest that time

should not be the criteria on whether or not an EIS is an adequate EIS. As we move along and learn more things, certainly we can do a better job of mitigating the difficulties in the future.

EPA says to look at the monthly and the annual releases, and one of the foremost sediment hydrologists of the country has said that it is the annual flows that make the big difference to the beaches, not the daily fluctuations. And, in fact, the studies are showing that the daily power fluctuations have very little to do with the erosion. The fact that the river is there is the reason we have erosion. Wind and people's use and other things are causing erosion. But the daily fluctuations do not do much.

Now, we have to concede that the ramp rate could make a difference, and that is part of what the studies that are taking place now are looking at. As the flow is ramped down toward the end of the afternoon or the end of the day, water can be stored in the bank. As it comes out, it can accelerate the erosion. Unfortunately, we do not know anybody yet who can tell us what a safe ramp-down rate is, and when we find it, we would expect to be able to accommodate it.

Senator BRADLEY. What is the ramp-down rate now?

Mr. CLAGETT. I have it here someplace. Maybe I should supply that for the record unless you need it for the discussion.

[The information follows:]

At this time there are no formal restrictions on ramp rates at Glen Canyon. A review of historical operating records indicates that 90 percent of the time, the change in water release rate from hour to hour (ramp rate) is less than 5000 cfs/hour. The majority of cases where the ramp rates exceed 5000 cfs/hour are due to situations beyond Western's or the Bureau's control: (1) power system problems (such as the sudden loss of generation, loss of transmission capacity, other electrical system disturbances) and (2) rescue activities below the dam, which require a rapid response from Glen Canyon Powerplant.

Senator BRADLEY. Well, it gives me an idea. You say that maybe the problem is the ramp-down rate, and we need to make it less.

Mr. CLAGETT. The ramp-down rate that had been used was somewhere around 7,000 or 8,000 second feet per hour. It is a very substantial amount, and that has been recognized for a long time as being too fast a rate. And so, we have not been operating anywhere around there. We have been closer to 4,000 or 5,000 second feet per hour. And maybe that is too fast, and if it is, we will have to change it. But right now we do not know what the ramp rate should be.

Senator BRADLEY. And how will you find that out?

Mr. CLAGETT. That is supposed to come out of the studies that are taking place now.

Senator BRADLEY. You mean your power studies.

Mr. CLAGETT. The research flows that are taking place that the Bureau of Reclamation is running.

Senator BRADLEY. So, out of the EIS.

Mr. CLAGETT. Yes.

Again, in this same letter that just came in the last 2 or 3 weeks, EPA and the National Academy of Sciences are both asking for caution in making changes. And that is something I think is very important, Mr. Chairman. This river is a new river, as you heard

earlier. It is going to change a little bit at a time, and we should be cautious in making drastic changes in too short a period of time.

We have an interesting history where from 1964 until 1982 the releases were 8.25 million to 9 million acre-feet annually. And then suddenly in 1983, 1984, we had flood releases; 1985, 1986, 1987 were very substantial releases. Those releases ranged from anywhere from 13 million acre-feet in 1 year, clear up to 16 million or 17 million acre-feet. And now all of a sudden, we go back to 8.25 million acre-feet.

And what happens is the personality of the river has to change when you make that drastic a change. And that personality change is what a lot of us are seeing now, and it is being perceived as damage. I am not sure whether it is damage, but it is certainly normal—when you make that much of a change in the flow, it is normal to have change. And you have to expect changes in the river. But it is that big variation in hydrology from year to year that does make a difference.

[The prepared statement and a subsequent submittal by Mr. Claggett follows:]

PREPARED STATEMENT OF WILLIAM H. CLAGETT, ADMINISTRATOR, WESTERN AREA
POWER ADMINISTRATION, DEPARTMENT OF ENERGY, ON S. 2807

Mr. Chairman and Members of the Subcommittee, I appreciate the opportunity to be here today. My testimony will provide an overview of the Western Area Power Administration (Western), and briefly recapitulate the lengthy history of environmental efforts associated with Glen Canyon Dam and also will comment on the energy impacts of S. 2807. We believe the bill is premature, but will defer to the Department of the Interior with regard to the Administration's position S. 2807.

OVERVIEW OF WESTERN

The Western Area Power Administration was established in 1977 to market and transmit power produced at 50 Federal hydro powerplants owned and operated by the Army Corps of Engineers, the Bureau of Reclamation (Reclamation), and the International Boundary and Water Commission, U.S. Section. In addition, Western markets the U.S. entitlement in the coal-fired Navajo Powerplant near Page, Arizona. Prior to Western's creation these functions were carried out by Reclamation.

Western serves 609 wholesale power customers in 15 western States including electric cooperatives, municipalities, public utility districts, investor-owned utilities, Federal and state agencies, irrigation districts, and Reclamation projects and facilities. In turn, our wholesale customers provide service to millions of retail consumers in the West.

Western operates and maintains more than 16,500 miles of transmission lines, 259 substations, and other associated power facilities. Western's primary mission is to market Federal hydropower "... in such manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles ..." (Flood Control Act of 1944).

In marketing power and energy, Western is governed by several statutory requirements. Two of the more pertinent requirements are: (1) preference in the sale of power shall be given to municipalities and other public corporations or agencies, and also to cooperatives and other nonprofit organizations financed in whole or in part by loans made under the Rural Electrification Act of 1936 and (2) revenues from the sale of power and energy must be sufficient to pay not only for the costs of power generation and transmission, but also pay for certain other costs, such as irrigation and salinity control, which are assigned by law to be repaid by power revenues.

At the end of Fiscal Year 1989 the total investment to be repaid by Western's power revenues was approximately \$5.0 billion, of which \$2.1 billion had been repaid. Cumulative power revenues of \$8.7 billion have been applied as follows: \$3.3 billion for operation and maintenance and other expenses; \$1.8 billion for purchase power and wheeling; \$1.5 billion for interest; and \$2.1 billion for repayment of the Federal investment in power and irrigation facilities.

OVERVIEW OF GRAND CANYON ENVIRONMENTAL EFFORTS

The need to investigate the potential impacts to downstream environmental resources from the existence of, and operation of, Glen Canyon Dam and Powerplant was recognized as early as 1976 by then Commissioner Stamm of the Bureau of Reclamation. Reclamation asked Congress for appropriations in their Fiscal Year (FY) 1980 budget request to prepare an environmental impact statement (EIS) that would include the effects of Glen Canyon Dam. Funds were not appropriated for this purpose, apparently because Congress was concerned that an EIS would delay the construction of Colorado River water projects.

During this timeframe, Reclamation was studying uprating the electric generators at Glen Canyon Dam. Lake Powell also filled for the first time in 1980. In 1982, the Secretary of the Interior initiated the Glen Canyon Environmental Studies (GCES) in response to public concern over possible impacts downstream from Glen Canyon Dam due to operations of the facility and use of the uprate capacity. Recognizing that a study would require the active participation of all agencies and groups with an interest in the Colorado River, Reclamation invited the involvement of the Fish and Wildlife Service, the National Park Service, the Geological Survey, Arizona Game and Fish Department, water and power users, and environmental and recreation groups.

It should be recognized that funding for the GCES comes from Reclamation Colorado River Storage Project (CRSP) reimbursable operations and maintenance monies, which are funded from the power rate Western charges its power customers. Phase I of the GCES included over 30 individual technical studies on various natural resource components in the Grand Canyon. The GCES were meant to answer two questions:

1. "Are current operations of the dam, through control of the flows in the Colorado River, adversely affecting the existing river-related environmental and recreational resources of Glen Canyon and Grand Canyon?"
2. "Are there ways to operate the dam, consistent with CRSP water delivery requirements, that would protect or enhance the environmental and recreational resources?"

In 1986, with the technical studies nearly completed and the integrated Final Report under preparation, the Water Science and Technology Board of the National Academy of Sciences (NAS) was asked to review the technical merit of the GCES. The GCES Final Report was completed in January 1988, and revised in May 1989. It concluded, amid controversy, that some aspects of the operation of Glen Canyon Dam adversely affected downstream resources, and that modified operations could protect or enhance these resources.

However, it is most important to note that the GCES Final Report itself stressed that "This study was not intended nor designed to lead directly to changes in dam operations" and emphasized that "These modifications should not be considered as fully developed or recommended operational schemes." While the NAS board generally approved of the research efforts that had been undertaken as part of GCES, it could not agree that the recommendations included in the final report were supported by the research that had been completed at that time. The NAS review report suggested that further information was needed, including an evaluation of impacts to power generation, before long-term decisions could be made concerning the operation of Glen Canyon Dam.

Along with these two reports, a third report was generated by the Executive Review Committee (ERC) of the GCES, which is made up of management and policy level representatives of the Department of the Interior (DOI), Reclamation, Fish and Wildlife Service, National Park Service, and Western. The ERC was established to translate the technical study results and GCES program findings into a series of policy options for DOI to consider.

The ERC Final Report of May 1988 contained recommendations on some points, and reflected a lack of consensus on others. There was consensus that additional studies were needed on the impact of fluctuating flows on aquatic habitat, beaches, and the endangered humpback chub. All representatives were in agreement that releases from Glen Canyon Dam should not exceed 31,500 cubic feet per second (cfs) unless necessary to respond to an emergency situation. Potential flood frequency, defined as releases over powerplant capacity, should be reduced to one-in-twenty years or less, and research releases would be provided for data collection purposes. The ERC also found that management of the Colorado River, Glen Canyon National Recreation Area, and Grand Canyon National Park needed to be better coordinated.

Although consensus was reached on the issue of research releases, no agreement was reached on other interim operations issues such as minimum flow or fluctuat-

ing flow limits. Similarly, no agreement was reached by the committee on which of three decision options it should recommend to the DOI: (1) No change in present operations, (2) additional interim studies should be completed, or (3) NEPA compliance should be initiated. Individual position statements and recommendations by each of the agencies were included in the ERC report as clarification.

All three of these reports and other information were provided to the DOI in May 1988. On June 16, 1988, in a memorandum to Reclamation, the Fish and Wildlife Service, and the National Park Service, DOI directed that further study be undertaken. Phase II of the GCES was to address "(1) the effects of both low and fluctuating flows on endangered fish species, the trout fishery and beach aggradation and degradation, and (2) detailed economic analysis of operational options." It was further directed that "The data required for these studies will be acquired during normal operation of Glen Canyon Dam" and "You should make every effort to eliminate any impact on normal power operations." GCES Phase II was delayed in implementing additional studies while the various resource agencies defined their data requirements and identified appropriate avenues of study.

On July 27, 1989, the Secretary of the Interior directed Reclamation to prepare an EIS on the impact of Glen Canyon Dam operations on the downstream environmental and ecological resources within Grand Canyon National Park and the Glen Canyon National Recreation Area. The EIS is to be completed by the end of 1992. The GCES are to continue at the same time, developing technical information to meet the requirements of the EIS, and may continue beyond the completion of the EIS as the framework to conduct long-term monitoring and data collection activities. Western is a cooperating agency in the EIS effort, and continues to be actively involved in GCES Phase II.

DISCUSSION OF S. 2807

With the foregoing history in mind, I would now like to make some specific comments regarding S. 2807. I would like to focus my remarks on two issues: the current environmental studies and the energy impacts of changes proposed in the bill.

Under Section 2, the bill asserts current operations have a substantial adverse impact on downstream natural resources, acknowledges the ongoing Interior EIS, and states that interim operating criteria can partially mitigate the adverse impacts. However, with GCES Phase II and Interior's EIS under way to determine the effects of present operations, identify alternatives, and make recommendations regarding appropriate operating criteria, we believe it is more appropriate to wait for the completion of these studies prior to taking any action.

Reclamation invited the Water Science and Technology Board of the National Academy of Sciences to review the final report of GCES Phase I for technical merit. It was felt that an impartial, third-party review by knowledgeable members of this respected national organization would help establish the credibility of the GCES Final Report for Phase I and its findings. The NAS praised the researchers' dedication and the goals of the GCES, and generally felt that the research conducted was heading in the right direction and had the right objectives.

However, the NAS's final Review Report stated that the committee does not believe that the Bureau of Reclamation can make long-term decisions concerning the management of Glen Canyon Dam based on the GCES . . . and "Although the final draft GCES report recommends several options, this committee believes that only those calling for additional work are justified." Regarding the conclusions and recommendations in the final report, the NAS said ". . . it is not clear how the authors arrived at their bold, box enclosed-statements even after inspection of the supporting appendixes." This last NAS comment refers to the format of the GCES Final Report, which highlighted their summary "findings" in line-enclosed boxes.

The GCES Phase I Final Report has been widely cited as "proof" that serious impacts to Grand Canyon natural resources are occurring, and that immediate action is required to "save the canyon." However, as indicated by the foregoing quotes, the impartial NAS felt that further work was needed before any of the findings of the GCES Final Report could be substantiated. Acting upon the NAS's recommendations, and those of others, Reclamation initiated Phase II of the GCES to plug the noted data gaps and provide the solid technical data base for informed decision-making. Coupled with the public process and the alternatives which will be identified in Reclamation's EIS, there will soon be enough information available to consider appropriate changes to the operation of Glen Canyon Dam.

As part of Reclamations ongoing EIS and GCES Phase II, we are working with Reclamation to accommodate an extensive series of research releases to allow GCES researchers to collect data for the EIS under controlled flow conditions. The DOI Assistant Secretaries' memorandum of June 16, 1988, said that data collection

should be accomplished under normal operating conditions and with minimum impact on normal power operations. However, it was agreed among GCES participants that research releases would both expedite the data collection process and improve the quality of the data collected.

Participation in these research releases is not without cost, as they will increase Western's thermal firming energy purchases by an estimated 517,000 megawatt-hours, and result in cost increases of \$16.2 million. Interim changes to operating criteria could conflict with these planned research releases, interfere with data collection for the EIS, and impact the environment that has developed in the canyon. Furthermore as the EIS relies on comparisons of alternatives to the "no action" option, or base case alternative for impact assessment, modifications to operations on an interim basis may make it impossible to define these impacts.

The primary environmental issue in the Grand Canyon, and the one driving calls for interim operating criteria, is the perceived degradation of beaches, particularly in the upper reaches of the canyon. Beach erosion in the Grand Canyon has been portrayed, particularly by the media, as extensive and rapid. However, the studies that have been done do not support these allegations. An unpublished 1984 National Park Service study by Brian and Thomas examined 227 beaches in the Grand Canyon that could be matched to beaches studied by Weeden et al. in 1973, a decade earlier. Size capacity changes after 10 years, and more importantly after the 1983 flood flows, showed a 34% decrease in small campsites, an 80% increase in medium campsites, and a 10% decrease in large campsites.

The researchers noted an increase in small campsites in Lower Marble Canyon and Upper Granite Gorge, an overall increase in medium campsites throughout the canyon, and a substantial decrease in large campsites from Lees Ferry to Kanab Creek, but with offsetting increase from Kanab Creek to Granite Park. Campsites that exhibited no discernible size change formed the largest statistical group at 42% of the total. Thirty percent of the campsites increased in size, while 28% decreased in size.

The study identified 32 campsites that had been lost prior to the 1983 flood event, and an additional 24 lost during that flood. However, 86 pre-existing campsites were increased in size by 1983 high water deposition or related vegetation removal, and 50 new beaches suitable for camping were deposited where none had existed previously.

Despite much study, the beach aggradation and degradation process is still poorly understood, and one of the primary goals of GCES Phase II is to expand our knowledge in this area. The authors of the Phase I documents went to great lengths to stress that the findings were preliminary and not for use as the basis for decisions without further investigation. Reclamation's EIS and GCES Phase II are meant to complete this investigation, identify alternatives and mitigation measures, and quantify to the extent possible both the positive and the negative effects of each so that informed, reasoned decisions can be made.

There are those who point to hourly and daily fluctuations in dam releases, caused by power generation following load fluctuations, as the cause of alleged beach loss. Answers to questions concerning the sediment transport system in the Grand Canyon are a primary goal of GCES Phase II. However, it is known that the lack of sediment replenishment due to the presence of the dam, not necessarily the operation of the dam, creates the unused sediment carrying capacity in the river. Clean water is "hungry water" with regard to sediment, and will have the tendency to pick up sediment regardless of operating pattern.

Other factors, such as wind erosion and human activity, may affect the canyon's beaches as well. These effects have yet to be investigated or quantified. These factors may act independently from restrictions on fluctuating flows, and afford some opportunities for beach management and enhancement. The comprehensive studies represented by the GCES and the EIS process will allow the development of reasonable and comprehensive beach management options and mitigation measures in addition to possible alternative operating criteria.

The environmental issues in the Grand Canyon are complex. Flood releases during 1983-84 did have high identifiable impacts, but proposed changes in reservoir storage criteria now being negotiated between Reclamation and the Basin States may essentially eliminate the risk of releases in excess of the 33,100 cfs powerplant capacity. The riparian habitat has greatly expanded as have the numbers and diversity of wildlife species, including an increase in backwater habitats, rare in the years before the dam. Some of the beach "loss" is directly due to vegetation encroachment, as a result of increased riparian vegetation in the Grand Canyon. The river supports more zooplankton, diatoms, and benthic vegetation than formerly.

The trout fishery is considered one of the best in the western United States, and the white-water rafting experience is rated as world-class.

S. 2807 appears to require the Secretary of the Interior to give priority to the Grand Canyon and subordinate some other considerations. In a worst-case scenario, modifications to current operations by baseloading or constant flows could decrease the availability of a renewable resource, Glen Canyon hydropower, by up to 850 megawatts (MW). This resource could conceivably be replaced by either existing less-efficient or environmentally more-costly generation. In the long term, this legislation would require the acquisition of replacement generation.

Based on the studies and documents cited above, we feel that any future operational changes should be based on the results of the research releases, the GCES, and the EIS process. It is important to note that interim flows may affect the accuracy and credibility of these ongoing comprehensive studies.

Again, I appreciate the opportunity to be here, and I would be pleased to respond to any questions you or the Subcommittee Members may have.

MISCONCEPTIONS ABOUT GLEN CANYON DAM AND THE GRAND CANYON

This paper summarizes the major misconceptions that have been circulating regarding the Glen Canyon Dam, and the Colorado River through the Grand Canyon. Some of these misconceptions stem from misunderstandings or over-simplifications of the extremely complex environment and its interacting components in this area. Others are a result of a lack of knowledge about the dynamic Grand Canyon ecosystem; the scientists and researchers involved are by no means in full agreement. The many competing resources and interests further complicate the issues and obscure objectivity. Following each italicized misconception below is a brief discussion of the underlying issues, the facts as we know them, and the actual situation as best we have been able to determine.

Present Power Operations at Glen Canyon Dam are the Cause of All or Most of the Degradation of the Grand Canyon: This is not true. The evidence available from the Glen Canyon Environmental Studies and other related studies has not demonstrated that the changes to downstream resources are caused by power operations. Downstream effects due to power operations at Glen Canyon must be separated from those due to the physical *presence* of the dam, such as sediment-free, cool water. They must also be separated from the normal amount of ongoing change that characterizes a dynamic river system and its ecosystem.

Many of the "impacts" blamed on power operations are the probable result of one or more of the following: (1) measurements of the natural dynamics of a non-static river system, (2) measurements of the system attempting to reach the equilibrium it was approaching before the dramatic changes wrought by the 1983-84 floods, (3) comparisons of pre-dam conditions to post-dam conditions, (4) confusion of effects related to the *presence* of the dam for those resulting from the *operation* of the dam, or (5) expressions of inter-resource conflicts (e.g. trout vs. endangered fish). The perception of adverse impact has been aggravated by the insistence of some to use hypothetical "optimal" levels for recreation resources as a basis for comparison with present levels; anything less than "optimal" has been considered a negative "impact" of power operations. Present power operations do not prevent the recreational use of the Grand Canyon or its resources; present recreational opportunities such as white-water rafting and trout fishing are in fact considered outstanding.

Changing Power Operations at Glen Canyon Dam Will Prevent Further Impact to the Natural Resources in the Grand Canyon: This allegation has two components that need to be addressed; the effect of changing power operations and the definition of impact. Many of the "impacts" claimed could well have more to do with the natural processes at work in the Canyon, and the amount of water which must be released monthly, than with power operations. The damaging impacts of the 1983-84 floods, for example, had nothing to do with power operations, but caused a great deal of change in the Grand Canyon such as severely damaging the valuable marshes and wetlands that had been developing since Glen Canyon Dam was closed. Modifying power operations will not greatly influence the effects of the monthly releases. Changing water flows is not necessarily the most efficient, cost-effective, least impactful, or best solution in protecting the environmental resources in the Canyon. While restricted powerplant flows are easy to accomplish, the downstream effects are unpredictable and are not site- or resource-specific. Adjustments to power operations may well be a *part* of an overall solution to balance natural resource needs in the Grand Canyon, but only a small part. The rate at which flows are lowered, or ramping rate, needs to be investigated for its effects on beaches. Indeed,

many respected sediment experts believe that the beach erosion of concern is more the result of annual water volume than of daily or hourly fluctuations.

It is important to recognize that many of the supposedly impacted resources, such as trout, did not exist before the dam was built, and developed under present operating conditions. While each of these resources may not be maximized at present, we do not believe that characterizing the incremental difference between the current situation and a hypothetical "optimal" one as an "impact" is appropriate.

The Environment and Natural Resources in the Grand Canyon are Rapidly Being Destroyed: This charge is the single greatest fallacy that has been promoted in the Grand Canyon controversy. The ecology of the Colorado River and the Grand Canyon has *changed* since the dam was built. As discussed above, these changes are largely the result of the physical *presence* of the dam, and not the way it has been operated. The dam has moderated, but not eliminated, wide seasonal flow fluctuations and supplanted warm, turbid water with cool, clear water. Some of the resultant "impacts" have been:

Establishment of a blue-ribbon trout fishery considered one of the best in the American West.

Support of one of the best white-water rafting experiences in the world. (Prior to the construction of the dam, less than 1,000 people total had boated through the Grand Canyon. Today about 17,000 people take a raft trip *annually*, and the trip is so popular, the Park Service limits the annual usage of the Canyon for this purpose.)

Expansion of the riparian vegetation belt, reputedly the only riparian area in the Southwest to have *improved* in this century.

Greatly increased species diversity and numbers in the Grand Canyon, especially bird species, tied directly to the increase in the quality or the riparian habitat.

Establishment of an important bald eagle wintering area, and the largest breeding population of peregrine falcons in the lower 48 states.

Establishment of valuable marshland and backwater habitats that were rare before the dam was constructed. Unfortunately, the 1983-84 floods severely damaged these habitat areas, and the extent to which they will recover is not yet clear.

Continuing attraction of new species to the improved habitat in the Canyon.

Waterfowl and the great blue heron are now nesting in the Grand Canyon.

These "impacts" hardly represent an environment that is being destroyed. Of course, there have been negative changes as well, such as impacts to native fish species and beach erosion in the upper Canyon. It is important to note, however, that changes other than the construction of the dam have occurred, and have also influenced the environment in the Grand Canyon. Some experts believe that competition with introduced, non-native species, and not changes in water temperature and sediment load, is the main reason for the decline of the native fish populations.

The main point to be made is that the portrayal of the changes to the ecosystem as adverse, negative impacts that threaten the Grand Canyon is inaccurate. The Grand Canyon cannot be characterized or evaluated by any single element, but must be considered *an environment of many integrated elements*. The proper approach to managing these resources is to acknowledge that we have a new environment, different but by no means degraded, and that we need to learn how to manage it in order to balance the demands upon its resources.

The Grand Canyon Must Be Returned To and Preserved In Its Natural Pristine State: A tailwater environment now exists in the Canyon that needs to be managed, and no one really wants to give up the enhancements listed above. Warming the water and adding sediment to mimic the pre-dam environment could severely impact trout and endangered species such as the bald eagle and peregrine falcon, who rely on the new food chain that has developed due to the dam and its effect on water quality and temperature. The sound approach is to utilize valid scientific data to make informed management decisions that will balance the competing resources and interests, and attempt to maximize each to the extent possible. The ongoing EIS process is such an approach.

Peaking Power is the Same as Firm Power: Western no longer markets firm "peaking power"; we market long-term firm power, i.e. energy with a level of capacity that is expected to be available 90 percent of the time, based on historical hydrology. Although Western's customers are allowed to use some of their CRSP allocations during peak periods by means of scheduling, approximately 90 percent of the time additional capacity is available during on-peak hours. This extra capacity is therefore available for seasonal or daily sales, interchange, fuel replacement, or

other purposes on a short-term basis. These sales are not part of the long-term firm contracts, and are sold on an as-available basis.

The "13-Foot Wall of Water" and Ramping Rates: The Glen Canyon Environmental Studies (GCES) report "Executive Summaries of Technical Reports", page 7, states "... fluctuations can cause the river level to change by up to 13 feet." There is no reference within the report as to where this occurs on the river or what conditions precipitate this event. A review of three U.S. Geological Survey Colorado River stream gage rating tables—below Glen Canyon Dam, Lees Ferry (River Mile 0), and Grand Canyon (near Phantom Ranch, River Mile 87)—indicate that a 13-foot fluctuation is only possible at the Grand Canyon gage if Glen Canyon releases were to change from 1,000 cfs to 31,500 cfs in the course of a given day.

There may be other places where the canyon is narrow and the walls are near vertical, such as Marble Canyon, that could experience 13-foot fluctuations. To experience a "wall of water" Glen Canyon Powerplant would have to go from 1,000 cfs to 31,500 cfs instantaneously. Ninety-eight percent of the time Glen Canyon releases change 8,000 cfs per hour or less and it would take 4 hours or more to get to 31,500 cfs. It takes about 16 hours for the peak to travel from Lees Ferry to Grand Canyon. In that time there is an attenuation or smoothing of the fluctuation. For example, a 24,000 cfs flow past Lees Ferry, is reduced to 22,500 cfs when it reaches the Grand Canyon river gage, a distance of 87 miles. Minimum flows reverse this effect by tending to increase between the two points; an 8,000 cfs flow past Lees Ferry is increased to 9,000 cfs at Grand Canyon. The width and depth of the river channel, the distance downstream from the dam, the amount of change in water release, and the ramping rate all affect the water level change that would be seen at any given point making predictions very tenuous.

Western Believes That Power Generation and Power Contracts Have Primacy Over Environmental Considerations: Western has never taken the position that power generation, pursuant to Section 7 of the CRSP Act, or firm power contracts have primacy over environmental laws or processes. Western has stated that under Sections 7 and 8 of the CRSP Act, the legislative history of the CRSP Act, and Section 601(a) of the Colorado River Basin Project Act, the operation of the Colorado River Storage Project for recreational purposes such as fishing and rafting is subordinate to the operation of these facilities for *firm* (not peaking) power generation. This legislation does provide for the consideration of recreational and fish and wildlife resources; the fact that there is a blue-ribbon trout fishery and world-class white-water rafting below Glen Canyon Dam demonstrates that these interests have been considered and accommodated.

Western does not believe that power contracts have precedence over environmental law. Western held public meetings on its CRSP Post-1989 Power Marketing Criteria and completed a NEPA process, including an environmental assessment (EA) in 1986, before drafting contracts for the CRSP power resource. The power marketing criteria were challenged in court cases, which eventually led Western to announce in 1989 that we would prepare an EIS to more fully address the issues which have been raised. As a result of the controversy, Western modified the CRSP power contracts with a contract provision that allows for the adjustment of power allocations. The contract provision, which has been called a "reopener clause," recognizes the possible changes to power resources that may occur as a result of administrative decisions by the Secretary of the Interior to modify power operations based on the finding of the Bureau of Reclamation's EIS. Even without this specific contract provision, Western power contracts remain flexible to changes in power resources precipitated by environmental considerations as we can adjust our power purchases from other sources to meet our contractual commitments.

Steady Releases of Water Each Month Will Minimize Impact to the Resources of the Grand Canyon: This position has been advanced openly or implicitly by a number of interested groups and individuals, who feel that the Canyon must be protected from "wild fluctuations" in flows. The alleged "wild fluctuations" occurring now are much smaller and shorter in duration than the ones that occurred naturally, before Glen Canyon was built. Adherence to an "inflow equals outflow" steady release program would actually result in bypass releases, or flood releases, from Glen Canyon Dam since, even in average water years, monthly inflows into Lake Powell in the spring exceed a 31,500 cfs average.

At first glance, the steady release option seems to have some merit; such a program would remove daily fluctuations, tend to raise minimum flows and lower maximum flows (on a given day), and ostensibly "preserve" the environmental situation as it exists today by "stabilizing" it. However, the Grand Canyon ecosystem was not naturally a static one, nor is it now. It is one of long-term dynamic equilibrium, with short-term shifts in response to natural environmental factors such as

droughts or high water. The natural environment in the Grand Canyon is constantly changing, and to impose such artificial "stability" would remove the very dynamic aspects of the ecosystem that characterize it. The result of imposed steady flows would be a highly unnatural situation; the "stable" conditions would immediately trigger responses in the ecosystem, thus in the long term defeating the intended purpose of "preserving" the status quo.

Western Objects to Interim Flows: Western has no objections to interim flows so long as they are initiated after all research releases for environmental data collection are completed, they do not interfere with the collection of monitoring information, and they are scientifically supportable. However, if the selected interim flows differ too much from the present conditions, then a new set of downstream effects could affect the quality and validity of information collected by the GCES for use in the Glen Canyon Dam EIS. Similarly, we have some reservations about comparing monitoring data collected under one operational situation to data collected later under another, especially when such comparisons will be used to justify or modify management options. Lastly, we believe that interim flows should be based on sound scientific data, not supposition.

Western supports careful modest changes with follow-up monitoring and review to ensure implemented changes are effective and benefit the targeted resources, and do not have unanticipated negative effects. A case in point is the Fish and Wildlife Service's reversal of its previous position concerning a multilevel intake structure at Glen Canyon. Initially, they were strongly in favor of a multilevel intake structure to foster warm water releases that would benefit trout and the endangered humpback chub. They reversed this position when they found that warmer water attracted predatory striped bass further upstream from Lake Mead than expected, posing a threat to both the trout and chub populations.

The EDF Economic and Western Financial Studies Provided to Congressman Miller are Comparable Studies with Different Results: The two studies are related, but are not comparable. The EDF study is an economic study using a production cost model which looked at regional loads, made assumptions about the resources in the region available to meet those loads, and calculated the basic costs of producing energy to replace that lost by changing power operations at Glen Canyon. The result was a measure of the shift in thermal production costs within the region. The EDF study did not attempt to estimate an increase in the costs incurred by one utility, or financial transfers from one utility to another. Rather, it calculated the overall regional costs of alternative operations.

Western, on the other hand, used the same hypothetical changes in operations and analyzed its generation resources, firm load commitments, and current market purchase power prices to determine the *financial* impact on our cost of doing business. Western's study included the cost of *capacity* purchases as well as energy purchases, looked at how surplus power would be sold, and used rates that we would reasonably expect in either case. Due to the inherent difference in approach and philosophy (cost of production vs. expected purchase/sales prices), assumptions common to both studies used different values in the computations. Therefore, it is not surprising that the two studies produced different findings—they examined different measures.

Fluctuating Flows are Impacting Cultural Resource Sites in the Grand Canyon: A very few sites are apparently becoming exposed due to toe slope erosion of beach deposits, which may or may not be due to fluctuating flows. Although surveys have yet to be done, it is entirely possible that more sites are being exposed by a combination of wind action and a lack of annual replacement sediment deposited over the buried sites by pre-dam uncontrolled spring floods. Neither of these two factors are related to power operations and daily flow fluctuations; the dam traps sediment in Lake Powell regardless of operation. Cultural resources in the Grand Canyon are at far greater risk from vandalism or illegal collection than they are from fluctuating flows. The National Park Service surveys cultural resources sites out to about the 500,000 cubic feet per second (cfs) water line, but releases for power operations cannot exceed 31,500 cfs. Therefore, power operations could not possibly affect the majority of these sites. The 1983 peak flood releases did not even reach 100,000 cfs.

Senator BRADLEY. Now, how do you estimate the costs of a change in the minimum flow rate? Do you have a computer model?

Mr. CLAGETT. Well, there were a couple of studies—well there have been three or four studies done recently trying to answer that question. I think that is fair to say that we do not have a model that we are comfortable with yet, and I am certain that there are

other models around. EDF has an excellent model, but there are some things about it that we think are inadequate, and we think both approaches need improvement.

Senator BRADLEY. So that basically the model that you now have and you are working from you think might, indeed, have certain simplifying assumptions that might understate or overstate costs? For example, assumptions related to timing of power purchases or shaping of minimum flows. Those have great implications for costs, would you not agree?

Mr. CLAGETT. Yes.

Senator BRADLEY. And you say you are not satisfied with yours right now?

Mr. CLAGETT. I think we can come close to estimating what the costs are, but you have to be willing to accept the assumptions that go with it. And what we end up with then is a range, and the range has a multiplier to it.

Senator BRADLEY. A range is an escape. Right? It may be necessary, but—

Mr. CLAGETT. When a large nuclear plant goes down—and that is a major part of the energy supply in the system—and it is near Glen Canyon, then all of a sudden the surplus power that might be available or the firm power that we need to serve firm loads suddenly becomes very expensive. You have changes like that that are very difficult to foresee. So, we have to have a range.

I think that EDF and WAPA have both been working very hard and long in coming up with what would be an acceptable model for these studies—very talented people, very dedicated people working very hard to come up with a model that people can agree to—and yet we still do not have one. We are very close to it.

Senator BRADLEY. And you have done some analysis on load growth. Right?

Mr. CLAGETT. Yes.

Senator BRADLEY. And the most recent show what? A 15 percent increase load growth by 1994?

Mr. CLAGETT. That sounds about right, but that is not per year. That is 15 percent total between now and 1994.

Senator BRADLEY. What would that be based on, and does it take into account congressional decisions related to other CRSP facilities?

Mr. CLAGETT. No. Load growth for us is something that is of interest, but we do not serve load growth. Unlike Bonneville Power or TVA, we do not serve load growth. We have a product to sell, and we market it to those who take it. But we have a contract rate of delivery that is established based on the resources we have available.

On the Colorado River Storage Project, for example, we market nearly 1,400 megawatts of firm power, and that is on a non-coincident basis. On a coincident basis, that comes down to less than 1,200 megawatts. The combined resources of the Colorado River Storage Project are 1,800 megawatts. So, at any point in time we serve all of our firm loads with a maximum—for one time during the year for a few hours a year—that is less than 1,200 megawatts on a system that will produce 1,800 megawatts.

Senator BRADLEY. And you maintain that your firm power commitments, contracts, take precedence over environmental considerations below the dam?

Mr. CLAGETT. No, not entirely. The CRSP Act very clearly says—the word “practicable” is in there. And that has some flexibility in it. We believe that we can work out whatever difficulties are identified. Certainly the Endangered Species Act, for example, takes precedence over it. And there are other regulations.

Within the firm power that we have, there are different shapes and different kinds of firm power. There is flexibility in what kind of firm power product that we can market. It might be shaped a little different if this ramping rate, for example, has to be a much lower ramping rate. That means we do something in the afternoon that is different than we might have done in the past.

Senator BRADLEY. Thank you very much, Mr. Clagett.

Mr. Barrett.

**STATEMENT OF CLIFFORD I. BARRETT, EXECUTIVE DIRECTOR,
COLORADO RIVER ENERGY DISTRIBUTORS' ASSOCIATION,
SALT LAKE CITY, UT**

Mr. BARRETT. Thank you, sir.

I am Cliff Barrett. I am Executive Director of the Colorado River Energy Distributors' Association, otherwise known as CREDA. I have given you a detailed statement. I think for time's sake, I will just briefly hit the highlights of our statement.

We share this committee's concern that current power plant operations may be causing significant adverse impacts on downstream environmental resources. We support Secretary Lujan's decision to initiate an environmental impact statement to study those impacts. CREDA is committed to the search of appropriate mitigating measures, including operational changes, as well as other resource management actions. CREDA is also on record in concert with the seven Basin States supporting the Secretary's decision to implement interim measures during the time prior to completion of the EIS.

CREDA strongly believes, however, that S. 2807 is not needed to empower the Secretary to act to protect the Grand Canyon. Furthermore, CREDA believes that S. 2807 interferes with the NEPA process by imposing procedural and substantive requirements that are not necessary to achieve the goals of the legislation.

If Congress wishes to act, it should do so in a much more limited fashion. While we believe that this legislation is unnecessary, we feel obligated to comment on how legislation could be crafted to achieve the stated purposes of this bill. We think the bill should be limited in scope to: (1) set a date certain for implementing interim release criteria. We think November 1, 1991 might be a reasonable date. And (2) establish a 3-year deadline for completing the EIS.

The interim criteria deadline would prevent efforts to delay action, and the EIS deadline ensures that timely, long-term decision making will be made.

S. 2807 as introduced contain provisions that limit the Secretary's authority under NEPA and may severely impact the Glen Canyon power resource. The provisions that threaten to interfere

with NEPA and complicate the EIS process are easily found in this bill. We have three major issues, and I will just briefly describe these with the draft the way it is right now.

First, the long-term mitigation measures in section 5 are of concern to us. Section 5(b) restricts the Secretary's authority to mitigate impacts of power plant operations downstream of Glen Canyon Dam to changes in power operating criteria alone. This prevents the Secretary from implementing other nonoperation mitigation measures that would otherwise be available under NEPA.

The bill directs the Secretary to prepare and submit a report to Congress that describes power operating criteria and other measures taken to protect the resources of the Colorado River. This language is not limiting, but applies only to the report to Congress. The problem is contained in section 5(b) which mandates action by the Secretary after completion of the findings, conclusions and recommendations of the EIS. That section, which is the driving force for post EIS action directs the Secretary to implement only power operating criteria.

Unless modified, section 5(b) would prevent the Secretary from implementing measures such as beach stabilization, changes in fishery regulations and other cost effective, nonoperational mitigation practices.

CREDA has certain accusations that this proposed change would allow drastic measures such as placing concrete armoring on the beaches. This is ludicrous. Neither CREDA nor any other credible entity has seriously proposed such measures. In our view, the proposed reasonable mitigation measures language does not contemplate and would not allow such extreme measures.

Our second concern deals with the interim operating criteria. Section 4 of the draft directs the Secretary to determine within 30 days after enactment of the bill whether sufficient scientific data exists to permit implementation of interim power operating criteria. The goal of this section is to direct the Secretary to make changes in power plant operations before the EIS is complete. In the findings of the bill, section 2(4), Congress finds that adverse effects of current power operations can at least be partially mitigated by the development and implementation of interim measures.

CREDA agrees with that finding. Our overriding concern centers on the parameters for interim flows set forth in section 4(b). That section requires the interim power operating criteria to be designed to: (1) minimize the adverse environmental impacts of Grand Canyon National Park and Glen Canyon National Recreation Area; (2) minimize flood releases; (3) maintain sufficient minimum flow releases to minimize adverse environmental impacts downstream; and (4) limit maximum flows to minimize adverse environmental impacts downstream.

You will notice I have emphasized the word "minimize" in a few spots. The use of the term "minimize" is unambiguous. It would require that the power plant operations be adjusted to guarantee the highest degree of protection downstream. Taken literally, to minimize fluctuating flows, the Secretary would be required to operate Glen Canyon Dam as a baseload generating facility. Taken literally, to minimize flood releases, consistent with the standards of sec-

tion 3, the Secretary would be required to drain the reservoir down to a level that would just meet annual water delivery requirements.

CREDA strongly urges that the term "minimize" be eliminated and that words at least "partially mitigate" or "reduce to the extent reasonably possible" be substituted. We just do not feel that Secretary has at this point in time the data in hand to take such drastic measures which the word minimize would imply.

Our third major issue is the need to distinguish power plant operations from reservoir operations. Bill McDonald and Bill Plummer have already testified to that. CREDA supports the position of the Basin States that the bill must be amended to absolutely make clear that distinction.

There are a number of other issues which we have with the draft which we detail in our report, Mr. Chairman.

But in summary, CREDA supports what we understand are the Senators' objectives in proposing this legislation. We are confident that the Secretary of the Interior has full legislative authority and the intent to accomplish these objectives. Therefore, no further legislation is needed at this point in time. However, if the committee desires to proceed with legislation, we are prepared to work with you to correct the several serious problems which the bill has as now drafted.

[The prepared statement of Mr. Barrett follows:]

PREPARED STATEMENT OF CLIFFORD I. BARRETT, EXECUTIVE DIRECTOR, COLORADO RIVER ENERGY DISTRIBUTORS' ASSOCIATION, ON S. 2807

My name is Clifford Barrett. I am Executive Director of the Colorado River Energy Distributors' Association, otherwise known as CREDA.

I. DESCRIPTION OF CREDA

CREDA is made up of 155 cities, towns, political subdivisions, and rural electric cooperatives in Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming. Together, our members serve about one million retail customers in the Colorado River Basin, which represents approximately three million people as well as industries, businesses, and farms in these states. Our members operate non-profit, consumer-owned electric utilities, primarily in rural areas.

Obviously, we have a great concern about what is going on and what may happen along the Colorado River below Glen Canyon Dam and in the Grand Canyon. At the same time, we have, as we must, a great concern about power production. Our members buy over 85% of the power that is generated from the Colorado River Storage Project ("CRSP") dams including Glen Canyon. Glen Canyon is really the backbone of the system and accounts for 70% of all the power that can be generated on CRSP dams in the Upper Colorado River Basin. That power is valuable to us not merely because it's there, but because it is produced at a time when our customers are most in need of electricity. It is the ability to produce this electric power at these peak periods that makes the resource valuable. This also allows our generating utility members to burn less coal and oil. Hydropower is a clean, renewable electric resource.

II. S. 2807 IS NOT NEEDED TO PROTECT THE GRAND CANYON: EXISTING LAW PROVIDES SUFFICIENT AUTHORITY TO SECRETARY TO ACCOMPLISH GOALS OF BILL.

We share the Committee's concerns that current powerplant operations may be causing significant adverse impacts on downstream environmental resources. We ("EIS") to study those impacts. CREDA is committed to the search for appropriate mitigating measures, including operational changes as well as other resource management actions. CREDA is also on record, in concert with the seven Basin states, as supporting the Secretary's decision to implement interim measures to mitigate the impacts of powerplant operations during the time prior to completion of the EIS.

CREDA strongly believes, however, that S. 2807 is not needed to empower the Secretary to act to protect the Grand Canyon. Furthermore, CREDA believes that S. 2807 interferes with the NEPA process by imposing procedural and substantive requirements that are not necessary to achieve the goals of the legislation.

In testimony before the House Interior Committee and here today, representatives of the Bureau of Reclamation, the U.S. Fish and Wildlife Service, and the National Park Service have unequivocally stated that the Secretary has sufficient authority under existing law to act to reduce harm to downstream natural resources. We think the Secretary acted responsibly, and as a good steward, when he initiated the EIS in July 1989; when he responded to public concerns by extending the deadline to complete the EIS; and when he stated his intent to implement interim flows.

We believe that existing law authorizes the Secretary to examine and evaluate a full range of structural and non-structural alternatives, including modifications to Glen Canyon powerplant operations. And, perhaps most significantly, CREDA fully expects the EIS to lead to reasonable changes in powerplant operations.

Absent evidence that compels a determination by Congress that the existing NEPA standards and procedures are inadequate for the goal of examining alternatives to current Glen Canyon operations, CREDA sees no sound reason for Congress to override NEPA, or to superimpose new procedures and standards on existing law.

CREDA believes Congress should accept the Secretary's commitment to establish interim water release criteria for Glen Canyon Dam within 90 days of the completion of test flows. The test flows will occupy all but 99 days from mid-September to their conclusion next July. This bill would affect, at most, those 99 days, plus no more than 90 days thereafter at which time the Secretary has committed to act. There is no evidence that any of the downstream resources will be irreparably damaged by intermittent periods of operation totaling only 189 days. Indeed, much of this time will be spent in balancing water deliveries for compact purposes and not so-called "normal operations." Thus, it is difficult to see how this bill can have its desired effect concerning interim flows.

III. IF CONGRESS WISHES TO ACT, IT SHOULD DO SO IN A MUCH MORE LIMITED FASHION

While we believe that this legislation is unnecessary, we feel obligated to comment on how legislation could be crafted to achieve the stated purposes of this bill. We think that the bill should be limited in scope to:

1. set a date certain for implementing interim release criteria, e.g., November 1, 1991 (90 days after completion of test flows on the current schedule); and
2. establish a three-year deadline for completing the EIS.

The interim criteria deadline would prevent efforts to delay action and force study participants to stay on schedule so that test flow data would be available before a decision on the interim criteria is made. The EIS deadline insures that timely decision making will be achieved.

The provisions in S. 2807 relating to a GAO audit of the cost/benefit analysis in the EIS; the allocation of the costs of the EIS study; and continued monitoring should also be retained.

A bill limited to these provisions would retain Secretarial discretion and decision-making in areas where he is clearly better suited to act than is Congress. It would also keep the debate from shifting to, and further complicating, the EIS process. CREDA believes the scientists have all they can handle now to sort out the impacts, sources and mitigation measures for this complex resource without encumbering the process with new mandates and interpretations.

IV. S. 2807, AS INTRODUCED, CONTAINS PROVISIONS THAT LIMIT THE SECRETARY'S AUTHORITY UNDER NEPA AND MAY SEVERELY IMPACT THE GLEN CANYON POWER RESOURCE

The provisions that threaten to interfere with NEPA and complicate the EIS process are easily found in this bill. CREDA views the following issues as of most critical importance:

A. Mitigation Measures

Sec. 5(b) restricts the Secretary's authority to mitigate impacts of powerplants operations downstream of Glen Canyon dam to changes in power operating criteria alone. This prevents the Secretary from implementing other non-operational mitigation measures that would otherwise be available under NEPA.

Sec. 5(c)(2) of S. 2807 directs the Secretary to prepare and submit a report to Congress that describes the "power operating criteria and other measures" taken to protect, mitigate impacts to, and improve the condition of the environmental and recreational resources of the Colorado River downstream of Glen Canyon. This language

is not limiting—but it applies only to the report to Congress. The problem is contained in Sec. 5(b), the provision that mandates action by the Secretary after completion of the findings, conclusions and recommendations of the EIS. That section—the driving force for post-EIS action—directs the Secretary to implement “power operating criteria” to meet the obligation to protect the park contained in the bill.

It is our understanding that the sponsors of the bill do not intend to interfere with the substantive and procedural standards established by NEPA. To ensure that S. 2807 does not undercut the NEPA process and does not tie the Secretary's hands, the bill must be amended to include directions to “implement other reasonable mitigation measures” in Sec. 5(b) and similar language in other places in the bill.

Unless modified, Sec. 5(b) would prevent the Secretary from implementing measures such as beach stabilization, changes in fishery regulations and other cost-effective, non-operational mitigation practices.

CREDA has heard accusations that this proposed change would allow drastic measures such as placing concrete armoring on the beaches. That is ludicrous. Neither CREDA nor any other credible entity has seriously proposed such measures. In our view, the proposed “reasonable mitigation measures” language does not contemplate, and would not allow, such extreme measures. Moreover, the groups making such accusations have been part of the EIS process and know that such extreme measures are not even being considered.

B. Interim Flow Standards

Sec. 4 of S. 2807 directs the Secretary to determine, within 30 days after enactment of the bill, whether sufficient scientific data exist to permit the implementation of interim power operating criteria for Glen Canyon Dam. The goal of this section is to direct the Secretary to make certain changes in powerplant operations before the EIS is complete. In the findings, Sec. 2(4), Congress finds that the adverse effects of current power operations “can at least be partially mitigated” by the development and implementation of interim measures.

CREDA agrees that interim measures may help mitigate the impact of power operations while the EIS is in progress. In a letter dated April 23, 1990, CREDA and the seven Basin states told Secretary Lujan that they would support his decision to implement an interim flow regime ninety days after completion of the research flows.

While we have concerns about the timing of such flows in the Senate bill and question the standard for data sufficiency, our overriding concern centers on the parameters for interim flows set forth in Sec. 4(b). That section requires that the interim power operating criteria be designed to:

- “minimize” the adverse environmental impacts on Grand Canyon National park and Glen Canyon National Recreation Area;
- “minimize” flood releases;
- maintain sufficient minimum flow releases from Glen Canyon dam to “minimize” adverse environmental impacts downstream; and
- limit maximum flows to “minimize” adverse environmental impacts downstream.

The use of the term “minimize” is unambiguous. It would require that powerplant operations be adjusted to guarantee the highest degree of protection downstream and the lowest degree of fluctuation in flows. Taken literally, to minimize fluctuating flows the Secretary would be required to operate Glen Canyon Dam as a base-load generating facility. Taken literally, to minimize flood releases, consistent with the standards of Sec. 3, the Secretary would be required to drain the reservoir down to a level that would just meet annual water delivery requirements.

For several reasons, CREDA does not believe this is the intent of the bill's sponsors. First, the term “minimize” directly contradicts the intent spelled out in the Findings section: that interim measures can “partially mitigate” impacts of powerplant operations. Second, at the time the interim measures are implemented there will be only minimal environmental impact data available; thus, there would be no scientific justification for such a drastic standard.

Finally, Sec. 4(b) substitutes Congressional conclusion for Secretarial discretion. Congress is ill equipped to dabble in scientific analysis and judgment; yet the “minimize” standard does just that. It robs the scientist and the Secretary of discretion to balance scientific knowledge and risk of mistakes. It also sets what may be an impossible standard by requiring that impacts to all resources be minimized when measures required for one resource may well be adverse to another resource.

CREDA strongly urges that the term “minimize” be eliminated and that the words “at least partially mitigate” or “reduce to the extent reasonably possible” be substituted.

C. Need to Distinguish Powerplant Operations From Reservoir Operations

CREDA supports the position of the Basin States that the bill must be amended to make absolutely clear the distinction between a requirement for new "power operating criteria" and the existing "reservoir operating criteria" set forth in section 602 of the Colorado River Basin Project Act of 1968.

These three issues are of paramount concern to the CREDA power customers. If left uncorrected, those provisions of S. 2807 could severely diminish the value of the Glen Canyon facility as the lynchpin of the CRSP water and power system.

D. Other Issues

The following issues are also of considerable concern to CREDA and its members:

1. Re-authorization of the Colorado River Storage Project. Sec. 3 of S. 2807 expands the purposes of the CRSP. While it is true that the bill does not directly amend the 1956 CRSP Act, the stand-alone declaration in Sec. 3 does, in fact, add additional purposes and implicitly re-orders existing project purposes. While protection and mitigation of adverse impacts to the downstream areas are, arguably, not new purposes, it is clear that the directive to operate Glen Canyon to "improve" the downstream resources is a new mandate. CREDA interprets that directive to include improving recreational opportunities and fishery resources to benefit boaters, rafters and sport fishermen.

CREDA does not object to the addition of this project purpose. If the CRSP purposes are to be expanded however, it is imperative that the shift in project benefits be accompanied by a shift in the allocation and repayment of project costs.

2. EIS and Research Flow Costs. Sec. 5(d) mandates that all "direct" costs of preparing the EIS shall be non-reimbursable. We are not sure how the term "direct" will be interpreted. It may have a very narrow definition, which would not be sufficient to relieve power users of the costs relating to the Glen Canyon studies, EIS activities, and research flow costs incurred. From 1983 to 1989, nearly \$7 million was spent on Phase I of the GCES. Those costs were paid, in their entirety, by CRSP power users. From 1990 to 1992, costs of the EIS, Phase II GCES studies and replacement power due to research flows are estimated to reach \$30 million. The goals and objectives of the GCES and EIS—including research flows—are clearly to examine alternatives to provide greater environmental benefits. CREDA believes that such a goal falls squarely within the activities described in Section 8 of the CRSP Act and, thus, the costs of these studies and the EIS should be non-reimbursable. To ensure that these costs are not borne by power customers, S. 2807 should be amended to clarify that not merely "direct" costs of preparing the EIS, will be non-reimbursable.

3. Congressional findings. Sec. 2(5) of S. 2807 is a troublesome summary of existing Federal laws that should be deleted. CREDA understands that the sponsors' intent is to recite, in abbreviated fashion, a list of reclamation and environmental laws already on the books that authorize the Secretary to protect the Grand Canyon. The fact that other Federal laws of major significance—such as those that address the Secretary's responsibilities towards the Indian Tribes in the Grand Canyon—are not included flaws the list fatally. Equally important, however, is the fact that Sec. 2(5) is erroneous. It characterizes all of these laws as placing requirements on the Secretary directly related to operation of the Glen Canyon Dam. The National Parks Organic Act does require the Secretary to operate Glen Canyon Dam in the manner described in Sec. 2(5). Nor does the Endangered Species Act. Additionally, the unstated purposes of several of the listed laws may come into conflict as conflicting resource needs are identified. This incorrect statement of congressional findings, at a minimum, creates ambiguity and mischief. At worst, it could raise a question about existing law that creates grounds for serious litigation. Section 2(5) should be deleted.

SUMMARY

In summary, CREDA supports what we understand are the Senators' objectives proposing in this legislation.

We are confident the Secretary of the Interior has full legislative authority and intent to accomplish these objectives. Therefore, no further legislation is needed at this point in time.

However, if the committee desires to proceed with legislation we are prepared to work with you to correct several serious problems with the bill as drafted.

Senator BRADLEY. Thank you Mr. Barrett. Mr. Graff.

STATEMENT OF THOMAS J. GRAFF, SENIOR ATTORNEY, ENVIRONMENTAL DEFENSE FUND, OAKLAND, CA, ACCOMPANIED BY SPRECK ROSEKRANS, ECONOMIC ANALYST

Mr. GRAFF. Thank you, Mr. Chairman.

As you know, I am a senior attorney with the Environmental Defense Fund. As you may not know, I did serve at one time for a little over 2 years as a member of the Colorado River Board of California.

I have with me today Mr. Spreck Rosekrans, an EDF economic analyst who was a principal co-author of the study we have come here to present.

I assume my full statement and the report attached to it will be part of the record.*

Senator BRADLEY. Your full statement will be included in the record.

Mr. GRAFF. Thank you. I will try and summarize what we have come here to say.

We have come here to testify about the conclusions we have reached regarding the economic costs of various proposed modifications in Glen Canyon's operating regime. This, of course, is not a complete economic analysis of these proposals. In fact, we have made no economic estimate whatsoever of the benefits of modified dam operations to rafters, fishermen, others, even what are known as existence values that all of us who share an interest and concern about the Glen Canyon might have.

We have, however, come to talk about costs, and I should note in the beginning that others have made quite outlandish estimates in the past about some of those costs. Just to give an example, in the so-called Peach Report, for 1992 and an 8,000 cfs minimum, that study estimated a \$15 million cost. We are pleased to see that in their more recent estimates WAPA has come down substantially from those estimates. They are now estimating a range of \$1 million to \$6 million in costs. EDF estimates approximately \$4 million. So, that is roughly a quarter of the earlier estimate.

What we hope to provide the committee today is a balanced and hopefully objective analysis of these costs. Before beginning, however, we should note that none of these costs are costs that will be charged to the U.S. taxpayer, nor would they, therefore, increase the projected Federal deficit. Under current Federal law, the Western Area Power Administration is required to recover all of its costs from the preferential power users to whom it sells its output, and this would presumably continue under the proposed legislation as well.

Indeed, the practical fiscal effect of the legislation from the Federal Government's perspective would simply be to reduce the massive Federal subsidy which the power users are currently receiving. From an overall societal perspective, though, there are economic costs to modifying the dam's operations, and that is what I will now testify about.

* The report submitted by Mr. Graff appears in the Appendix on page 107.

Using our so-called Elfin model, electric financial model, we developed five different simulations of alternative scenarios for dam operations. For each scenario, the amount of electricity generated each month at Glen Canyon Dam did not change. As the amount of electricity generated during a month depends only on the amount of water released during that month. So, the amount of energy is the same in all scenarios. The amount of kilowatt hours does not vary, and that is an important thing to keep in mind.

The timing of the release of water, however, was changed, and therefore the electricity generated by other resources, principally coal and natural gas-fired power plants was produced at different times to reflect the changes at Glen Canyon operations.

The cost impact is occasioned by a shift in generation from the less expensive coal plants to more expensive coal plants and to natural gas-fired plants.

The simulations were conducted for water years 1991 through 1995. Hydrologic data was based on expected values supplied by the Bureau of Reclamation beginning with adverse conditions for next year and ending with nearly average conditions in 1995. Escalation rates for fuel costs were based on the most reliable estimates available, and changes in expected precipitation or inflation could change the estimated costs that we came up with.

I would note here that our costs go up over the 5-year period that we studied. That is basically a function of three factors: load growth, which you mentioned earlier; increased expected water availability; and inflation.

The least constraining of the alternatives we considered required a year-round minimum of 8,000 cfs, compared to the current 1,000 at winter and 3,000 in summer, and a maximum change of 5,000 cfs in the ramp rate.

My understanding, incidentally, is that there are no restrictions currently on the ramp rate other than the research flows that are—that is not even a restriction on the ramp rate—and that therefore at least conceptually WAPA could go from 1,000 to 31,000 and back without any kind of ramp rate restriction.

Cost estimates for this alternative, for the 8,000 cfs minimum alternative, range from \$3.9 million in water year 1991 to \$6.5 million in water year 1995. The most constraining of the alternatives was the so-called baseload option in which the Colorado River would run at a constant flow each month to satisfy the Bureau's annual operating plan. Cost estimates for this alternative range from \$8.2 million in 1991 to \$19 million in 1995. For additional results and a more thorough explanation of the alternatives, we have attached our report and, as I understand, it is now part of the record.

How these increased costs are passed along would depend on whether Western maintained its present interim marketing plan and thereby changed its schedule of purchasing additional power to supplement its contracts, or Western changed its contracts and the firm power customers would then have to make their own deals for supplemental power.

Assuming the former option were selected and were expressed as an increase in Western's firm power rate, which now averages only approximately 10 mils or 1 cent per kilowatt hour, the rate would

increase only by a range of .07 cents, or 0.7 mil, to .33 cents, or 3 mils, per kilowatt hour, leaving the rate for firm power still a substantial bargain compared to market rates. That is just in round terms. If there is an increase at the maximum from 10 to 13 mils, Western's estimates for baseload firm power requirements out a few years and some of those high numbers that came out in their estimates estimated the value of firm power being 45 mils.

So, what the United States is doing currently is selling that value for 10 mils, and perhaps if even the most extreme case were taken here, it would go up to 13 for something that by Western's estimate has a value of 45. So, in other words, the United States is providing CRSP power users a substantial subsidy compared to the value of Glen Canyon power, and implementing new operating regimes would reduce slightly but come nowhere near eliminating that subsidy.

Senator BRADLEY. Do you want to summarize now, Mr. Graff?

Mr. GRAFF. Summarizing one final point, we did look at the air pollution impacts of changing the regime at Glen Canyon Dam and came out with the conclusion that they are roughly a wash, that the impacts for nitrogen oxides and CO₂ are favorable. Those for SO₂ are slightly unfavorable, and that really air pollution is not a factor that is important in this calculation.

Thank you.

[The prepared statement of Mr. Graff follows:]

PREPARED STATEMENT OF THOMAS J. GRAFF, SENIOR ATTORNEY, ENVIRONMENTAL DEFENSE FUND, ACCOMPANIED BY SPRECK ROSEKRANS

Mr. Chairman and members of the Subcommittee, I am Thomas J. Graff, a senior attorney with the Environmental Defense Fund (EDF). Accompanying me here today is Spreck Rosekrans, an EDF economic analyst, who was a principal co-author of the study we have come here to present.

The legislation which you are considering here today seeks to weigh the environmental benefits of modifying the operations of Glen Canyon dam against the economic impacts of those modifications, over the time period while formal and extensive environmental impact studies are completed on the dam's operations. The Glen Canyon Environmental Studies have been underway since 1982, and, in the absence of a decision on new dam operations, current operations continue to have adverse and, in some cases, irreparable environmental impacts. We do not come here today, however, to testify either in favor or against the proposed legislation although there should be little question regarding EDF's policy preference in favor of dam operations which impact least negatively on the Grand Canyon's ecosystem and recreational values.

We have come to testify about the conclusions we have reached regarding the economic costs of various proposed modifications in the dam's operating regime. This of course will not be a complete economic analysis of these proposals. In fact we have made no estimate whatsoever of the economic benefits of modified dam operations including not only such obvious benefits as those which rafters, fishermen, and associated businesses might experience but also those which all who value the ecosystem of the Grand Canyon even without experiencing it firsthand might gain from operational improvements.

Others, however, have made quite outlandish claims regarding the economic cost of these modifications and these we have examined carefully. What we hope to provide the committee is a balanced and hopefully objective analysis of these costs. Before beginning, however, we should note that none of these costs are costs which will be charged to the U.S. taxpayer, nor will they increase the projected Federal deficit. Under current Federal law, the Western Area Power Administration theoretically is required to recover all of its costs from the preferential power users to whom it sells its output. This would presumably continue under the proposed legislation as well. Indeed the practical fiscal effect of the legislation from the Federal Government's perspective would simply be to reduce the massive Federal subsidy

which the power users are currently receiving. From an overall societal perspective, however, there are economic costs of modifying the dam's operations and it is to these costs which we now turn.

For over ten years, EDF and others have been using Elfin (EDF's computer-based simulation model for electric utility operations and planning) to assess economic values associated with electric power production. Elfin is currently in use by regulatory agencies, by all major utilities in California and by a wide array of consultants in California and other parts of the country as well.

EDF became involved in the Glen Canyon Environmental Studies in November 1988, after reviewing Western's "Peach" report. EDF was concerned, along with others, including representatives of the Bureau of Reclamation, that the methodology used in the Peach report was simplistic and tended to overestimate the cost of changing operations. Since that time, EDF has participated, with representatives of Western, USBR and CREDA, on the GCES Power Economics Team, and has made a commitment to insure that economic impacts be evaluated properly so that decisions regarding Glen Canyon dam operations can be made based on accurate estimates of economic impacts. The Power Economics Team has made the decision to use both Elfin and EGEAS (Electric Generation Expansion Analysis System) to analyze the larger customers with firm contracts for CRSP power, and not to use Western's ATP (Alternative Thermal Plant) method.

More recently, at the request of Representative George Miller, Chairman of the House Subcommittee on Water, Power and Offshore Resources, EDF constructed a database representing consumers of Colorado River Storage Project power, and used the Elfin model to conduct simulations of the system with various operating constraints imposed at Glen Canyon Dam. The difference in total costs between the "alternative operations" simulations and the "current operations" simulation is the estimated cost of changing operations. (Using Elfin with this method of analysis is similar to the process the California Public Utilities Commission uses in its annual Energy Cost Adjustment Clause (ECAC) hearings to determine the rates that utilities must pay to independent power producers.)

Five different alternative scenarios for dam operations were simulated. For each scenario the amount of electricity generated each month at Glen Canyon dam did not change, as the amount of electricity generated during a month depends only on the amount of water released that month. The timing of the release of water, however, was changed and therefore the electricity generated by other resources (principally coal- and natural gas-fired power plants) was produced at different times to reflect the changes at Glen Canyon. The cost impact is occasioned by a shift in generation from the less expensive coal plants to more expensive coal plants and to natural gas-fired plants.

The simulations were conducted for Water Years 1991 through 1995. Hydrologic data for Glen Canyon dam operations was based on expected values as supplied by the Bureau of Reclamation, beginning with adverse conditions for WY 1991 and ending with nearly average conditions in WY 1995. Escalation rates for fuel costs were based on the most reliable estimates available. Changes in expected precipitation or inflation could change the estimated costs of changing operations at Glen Canyon dam.

The least constraining of the alternatives considered required a year-round minimum of 8000 cfs (compared to the current 1000 cfs in winter and 3000 cfs in summer) and a maximum change of 5000 cfs in any hour. Cost estimates for this alternative ranged from \$3.9 million in Water Year 1991 to \$6.5 million in Water Year 1995. The most constraining of the alternatives slated was the "baseload" option, in which the Colorado River would run at a constant flow each month to satisfy the Bureau of Reclamation's Annual Operating Plan. Cost estimates for this alternative ranged from \$8.2 million in Water Year 1991 to \$19.0 million in Water Year 1995. For additional results and more thorough explanation of the alternatives, we have attached the report to this testimony and request respectfully that it be made a part of the hearing record.

How these increased costs are passed along would depend on whether Western maintained its present interim marketing plan (and changed its schedule of purchasing additional power to supplement its contracts) or Western changed its contracts (firm power customers must then make their own deals for supplemental power). Assuming the former option were selected and were expressed as an increase in Western's firm power rate, which now averages only approximately 1.0 cents/kWh, the rate would increase only by a range of .07 to .33 cents/kWh, leaving the rate for firm power still a substantial bargain compared to market rates.

The report EDF prepared also estimated changes in the emissions of air pollutants that changes in Glen Canyon dam operations would cause in changed oper-

ations of thermal plants. Simulation results indicate a small net decrease in emissions of carbon dioxide and oxides of nitrogen for most years and alternatives (due to a slight shift from coal to natural gas), and a small net increase in emissions of sulfur dioxide for most years and alternatives (due to a slight increase in generation at some of the "dirtier" coal plants). Details are contained in the report.

Mr. Chairman, that conclude EDF's testimony. We would be pleased to answer any questions any committee member might have, either now or in the future, regarding the economic impacts of varying Glen Canyon dam's operating regime. We do remain committed to working with USBR, WAPA, CREDA and others in providing the highest possible quality information to help illuminate the potential alternative courses of action. Thank you for your attention.

Senator BRADLEY. Mr. Kanner, if you could summarize.

Mr. KANNER. I will summarize my summary, Mr. Chairman.

Senator BRADLEY. That is the best news I have heard.

[Laughter.]

STATEMENT OF MARTY KANNER, DIRECTOR OF GOVERNMENT RELATIONS, AMERICAN PUBLIC POWER ASSOCIATION

Mr. KANNER. APPA supports the timely completion of a comprehensive EIS that will fully evaluate the impact of current operations and come up with a preferred alternative. S. 2807 is unnecessary to achieve that objective. Moreover, APPA believes that this legislation effectively reauthorizes Glen Canyon Dam without a full consideration of the relevant and necessary information, threatens the objectivity and credibility of the NEPA process, is unnecessary to protect the canyon, and inappropriately advances recreational interests under the guise of environmental protection.

At its core, this legislation asks one essential question: how should water resource projects be managed to best meet multiple and often conflicting objectives? In authorizing a new water project, Congress first weighs the available information, benefit cost analyses, engineering studies and environmental assessments. Only if this information supports construction of a project is that project authorized and funded. Certainly Congress would not authorize a major multi-purpose water project absent that information.

Yet, S. 2807 would violate precisely that standard. This legislation results in a reauthorization of Glen Canyon Dam, and that reauthorization would occur without the benefit of all the relevant information on the impact of current operations, the impact of changed operations and alternative mitigation measures. Absent the necessary data and expertise, this legislation presupposes the conclusions of the EIS and preselects the preferred alternatives.

The Secretary of the Interior has broad statutory authority and responsibility to complete the EIS in a timely and comprehensive fashion and to protect the Glen Canyon throughout the process. As mentioned earlier today, the Secretary has made a number of commitments to achieve that goal completing the EIS within 3 years and instituting interim criteria within 90 days after completion of the research test period. Thus, the fulfillment of two of the primary objectives of this legislation are not dependent upon enactment of legislation.

The remaining question becomes is this legislation necessary to protect the Grand Canyon. Stated differently, the question is are current operations severely and irreparably damaging the Grand

Canyon and will this legislation halt that effect. As detailed to a greater extent in my written testimony, there is insufficient scientific data to support the assertion that an emergency exists or that irreparable damage is occurring.

A related issue is the timing of EIS. Even if we were to agree that there is currently severe damage occurring due to power plant operations, I would submit that we are unable to decide what is the appropriate mitigation measure. 8,000 cfs and 18,000 cfs have both been suggested today as possible solutions. Obviously, there is a substantial difference of opinion on what would be a proper mitigation scheme. Not only that, I would submit that the impact of those different operating schemes are unknown not only for power plant operations, but more importantly for the impact on the Grand Canyon and other resources within the canyon.

Mr. Chairman, earlier today you made reference to the Northwest Act. I would point out that the Northwest Regional Power Planning Act certainly does achieve a great deal in terms of protecting fish and wildlife in the Pacific Northwest. And I would also highlight the fact that under that legislation, the plan to protect fish and the environment is only implemented after an exhaustive public process that was designed to achieve and secure exactly the type of the information that the EIS is designed to present and did not implement changes prior to that information.

Another objective of S. 2807 is to mitigate the impact of power operations on white water rafting and trout fisheries. It must be recognized that rafting and trout fishing are not inherent parts of the Grand Canyon ecosystem. Put simply, protection or advancement of these interests should not drive the EIS nor justify this legislation.

Senator BRADLEY. Do you want to summarize, Mr. Kanner?

Mr. KANNER. In summary, I would state, Mr. Chairman, that APPA believes that the decisions of what changes, how much change and at whose expense should only be made on the basis of full and complete information. The purpose of the Glen Canyon EIS is to gather that information and answer those questions. Absent evidence that NEPA is inadequate to fulfill this role, this legislation would unnecessarily interfere with that process.

[The prepared statement of Mr. Kanner follows:]

PREPARED STATEMENT OF MARTY KANNER, DIRECTOR OF GOVERNMENT RELATIONS,
AMERICAN PUBLIC POWER ASSOCIATION, ON S. 2807

My name is Marty Kanner, I am Director of Government Relations for the American Public Power Association.

APPA and its members have a significant interest in the operation of Glen Canyon Dam and the outcome of the current Environmental Impact Statement (EIS) process. APPA supports the timely completion of a comprehensive EIS that will fully evaluate the impact of current operations, determine if there is a need for mitigation or enhancement measures, assess all reasonable actions and their environmental and economic effects, and consider the proper allocation of costs of any proposed action.

S. 2807 is unnecessary to achieve these objectives. Moreover, APPA believes that this legislation:

- effectively reauthorizes Glen Canyon Dam without full consideration of the relevant and necessary information;
- threatens the objectivity and credibility of the NEPA process;
- is unnecessary to protect the Grand Canyon; and

—inappropriately advances recreational interests under the guise of environmental protection.

APPA is the national service organization representing more than 1,750 locally controlled public power systems. Approximately 500 of these public power systems—in addition to 600 rural electric cooperatives—meet all or a portion of their bulk power needs through the purchase of power generated at Federal multipurpose projects. Federal power customers repay in full—and with interest—the Federal investment in hydropower facilities. This financial commitment made the construction of these multipurpose water projects economically feasible. In the case of Glen Canyon Dam, more than 90 percent of the total capital costs of this multipurpose project are repaid by Federal power customers.

LEGISLATION REAUTHORIZES PROJECT BASED ON INSUFFICIENT DATA

Federal power customers recognize that current economic and societal objectives may necessitate changes in the operations of Federal multipurpose water projects. These customers also recognize that the Glen Canyon EIS may determine that a correlation exists between current Glen Canyon power operations and environmental degradation in the Grand Canyon.

It is not our objective to block the Glen Canyon EIS or to prevent any and all changes in Glen Canyon power operations. To the contrary, our objective is to ensure that the EIS proceeds in an objective manner so that the selection of a preferred alternative for project operations reflects a proper balancing of competing interests. APPA wrote the Secretary of the Interior in August, 1989 in support of the decision to initiate an EIS and to urge its timely completion.

At its core, this legislation asks one essential question: how should water resource projects be managed to best meet multiple—and often conflicting—objectives. While this question is being asked about a project that was authorized more than 30 years ago and has been fully operational for a decade, it is essentially the same question that Congress addresses today when considering any new project authorization.

In authorizing a new water project, Congress first weighs the available information—benefit-cost analysis, engineering studies, and environmental assessments. Only if this information supports construction of a project is that project authorized and funded. Certainly, Congress would not authorize a major multipurpose water project without that information.

Yet, S. 2807 would violate precisely that standard. In essence, this legislation results in a reauthorization of Glen Canyon Dam, and that reauthorization would occur without the benefit of all the relevant information:

- the environmental impact of current Glen Canyon Dam power operations is not known. Despite the assertions of proponents of this legislation, the existing scientific data is insufficient to draw definitive conclusions or assess the impact of specific changes on the riverine environment. It is precisely that information that the Glen Canyon EIS is designed to collect;

- no assessment of alternative mitigation measures has been performed. Absent any analysis of alternatives, this legislation presumes that changes in power operations are the sole or preferred mechanism for both short-term and long-term mitigation of downstream environmental effects;

- no benefit-cost analysis has been conducted to determine if other mitigation alternatives would be more cost-effective; and

- no effort has been made to distinguish between those changes in project operations that are essential to provide environmental protection and those that are done to advance commercial recreational interests, such as rafting and sport fishing.

Unfettered by legislation, the Glen Canyon EIS would collect this information and address these questions. The Glen Canyon Protection Act would short-circuit that process.

LEGISLATION THREATENS NEPA PROCESS

The National Environmental Policy Act (NEPA) provides for an administrative process that is designed to produce informed decisions on the basis of substantive and objective scientific data. The statute and implementing regulations are carefully designed to assure the impartiality of the process. That impartiality is severely threatened by this legislation.

The Council of Environmental Quality regulations for implementation of NEPA state that “agencies shall not undertake in the interim any major Federal action covered by the program which may significantly affect the quality of the human environment unless such action: (1) is justified independently of the program; (2) is itself accompanied by an adequate environmental impact statement; and (3) will not

prejudge the ultimate decision on the program." Depending upon the timing of their implementation, the interim operating criteria called for under this legislation could contravene these principles since:

- existing scientific data are insufficient to justify changes in project operation or to select alternative operating criteria;

- it is unclear what impact interim flows implemented during the research period might have on subsequent data collection—or on the downstream environment; and

- forcing premature interim operating criteria will bias the EIS in favor of power operation changes as the preferred alternative by asserting in the absence of any real evidence that changes in dam operations is the primary and most appropriate means of mitigating downstream degradation.

The conflict with NEPA guidelines created by interim operating criteria are compounded by other sections of the legislation that virtually guarantee that operational changes will be selected as the "preferred alternative," and power generation will be relegated to the bottom of project priorities.

Enactment of S. 2807 would substitute political expediency for thoughtful decisionmaking. Absent the necessary data and expertise, this legislation presupposes the conclusions of the EIS and preselects the preferred alternative.

LEGISLATION IS UNNECESSARY TO PROTECT THE GRAND CANYON

The stated objectives of this legislation are to: (1) ensure the timely completion of the Glen Canyon EIS; (2) provide for interim operations to partially mitigate the impact of current operations; and (3) ensure the protection of the Grand Canyon. S. 2807 is unnecessary to achieve these goals.

The Secretary of the Interior has broad statutory authority and responsibility to complete the EIS in a timely and comprehensive fashion and to protect the Grand Canyon throughout the process. The Secretary has made several commitments that address the stated objectives of this legislation. Specifically, he has committed to:

- complete the EIS within three years, with the final EIS prepared by October, 1992 and a secretarial selection and implementation of a preferred alternative anticipated by January, 1993; and

- implement interim power operating conditions within 90 days after completion of the research test period, which will be completed by July 1991.

Thus, the fulfillment of the first two objectives is not dependent upon enactment of legislation.

The remaining question is whether this legislation is necessary to protect the Grand Canyon. Stated differently, the question becomes: are current operations severely and irreparably damaging the Grand Canyon and will this legislation halt that affect?

There is insufficient scientific data to support the assertion that an emergency exists or that irreparable damage is occurring.

The most recent scientific data was developed between 1982-1987 during Phase I of the Glen Canyon Environmental Studies (GCES). The initial objective of the GCES was to assess the impact of operating patterns of Glen Canyon Dam—at both high and low flows—on the river environment of the Grand Canyon. However, this study was skewed by the high flood flows that coincided with the study period—when water was discharged at three times the rate that occurs during maximum power generation. Consequently, as noted by the National Research Council—the umbrella organization for the National Academy of Sciences—in its review of the GCES, "with few exceptions the individual GCES reports refer to the effects of the flooding. . . ." and not to the impact of normal operations.

In fact, the NRC found numerous shortcomings with the GCES, stating that "the combination of sacrificed scholarly rigor and apparent value judgments increases the risk of misleading managers. This inappropriate use of science could lead to poor policy . . . although the final draft GCES report recommends several options, this (NRC) committee believes that only those calling for additional work are justified."

The legislation before you would lead to precisely the poor policy that this scientific review counsels against.

Central to the discussion of the rate and extent of environmental degradation is the need for interim operating conditions. APPA does not dispute the authority of the Secretary to implement interim criteria if he finds those changes necessary and justified. However, we adamantly oppose the implementation of interim flows prior to the completion of data collection during the research flow period.

As you know, research flows have already been initiated, and various research flow patterns will be in place for 222 days between now and July 26 of next year.

Thus, interim operating criteria would be in place for at most 140 days during that time period.

On the other hand, immediate implementation of interim flows will cost power customers between \$2 million and \$30 million annually, depending on the flow rate. These costs would be imposed on top of the \$16.2 million in replacement power costs that are anticipated to result from the research flow requirements and the \$13 million in direct EIS expenses that power customers are being asked to shoulder.

PROPOSAL ADVANCES RECREATION OBJECTIVES UNDER GUISE OF ENVIRONMENTAL PROTECTION

A primary objective of S. 2807 is to mitigate the impact of power operations on whitewater rafting and trout fisheries. It must be recognized, however, that rafting and trout fishing are not inherent parts of the Grand Canyon ecosystem. In fact, the Colorado River could not support a trout fishery prior to construction of the dam and river rafting has increased 20 times since construction.

Put simply, protection or advancement of these commercial and recreational interests should not drive the EIS nor justify this legislation. Recreational activities are certainly important—and it may be appropriate to take steps to protect or advance these interests. However, there is no justification for taking the extraordinary steps contained in this legislation to promote these concerns—to the likely detriment of power generation. The balancing of recreational and other commercial enterprises (such as power production and irrigation) is clearly an example of a project reauthorization that should be considered and pursued in the traditional fashion. Members of this committee have opposed similar efforts to alter project operations to benefit unauthorized project purposes (including recreation).

If, after completion of the EIS, Congress finds that additional efforts are desired to advance recreational interests, then Federal power customers are prepared to deal with the relevant issues at that time, including:

- the economic tradeoffs of reductions in hydropower and increased tourism dollars;

- the feasibility of non-operational alternatives to promote recreational activities. For instance, reducing the diversity of trout species planted in the Colorado would minimize the need for changes in project operation without diminishing recreational opportunities; and

- the equitable allocation of project costs. Both rafting and fishing are large and profitable commercial enterprises. According to the GCES, commercial rafting customers alone would be willing to pay annually about \$14.4 million more for the experience over and above what they actually pay. These direct beneficiaries should assume financial responsibility for the benefits they seek to secure.

CONCLUSION

As noted above, the central question before this committee is the proper and balanced management of a multiple purpose water project. Glen Canyon Dam was authorized to provide flood control, ensure delivery of sufficient supplies of water, harness the energy potential of the Colorado river and other purposes.

Water is a finite resource, and any effort to advance one interest can most often only be achieved at the expense of another.

APPA agrees that protection of the Grand Canyon is worthy of such effort and expenditure. However, we believe that the decision of which changes, how much change, and at whose expense should only be made on the basis of full and complete information. The purpose of the Glen Canyon EIS—as statutorily mandated under NEPA—is to gather that information and answer those questions. Absent evidence that NEPA is inadequate to fulfill this role, this legislation would unnecessarily erode the NEPA process.

The Secretary of the Interior has pledged to ensure that all reasonable steps are taken throughout this process to protect the Grand Canyon. Given those commitments, and given the precedent this legislation would set for dozens of other Federal water projects, the NEPA process should proceed unencumbered by legislative strictures and mandates.

Senator BRADLEY. Thank you very much, Mr. Kanner.

Mr. Litton made a suggestion, which is put the peaking at Hoover as opposed to Glen Canyon. Why is that not possible?

Mr. CLAGETT. Well, it is something we could sure look at. But basically Hoover was authorized as a separate act with separate purposes, and the contracts are with completely different people.

Senator BRADLEY. Do you agree it would eliminate the problem that we are holding this hearing on today?

Mr. CLAGETT. No, I do not agree, but I also do not disagree. I would sure like to go back and see if there is any potential on that. I just do not know the hydrology that well, Mr. Chairman, to give you an answer that I would be comfortable with.

Senator BRADLEY. Could you get back to us with your assessment of that suggestion?

Mr. CLAGETT. Yes, sir. I would be glad to.

[The information follows:]

Hoover is currently operated as a peaking facility. It is fully committed to contractors in Arizona, Nevada, and California pursuant to the 1984 Hoover Powerplant Act and the Conformed General Consolidated Power Marketing Criteria or Regulations. For economic reasons, these contractors schedule their Hoover resources to meet peaking loads to the extent possible. There remains little potential peaking resource at Hoover for long-term replacement of lost capacity at Glen Canyon. Under special circumstances Hoover can be, and is, used to replace some peaking at Glen Canyon for short periods of time. Called "interchange," this is a normal utility practice to promote efficiency in the interconnected system. As Hoover is already functioning as a peaking powerplant, and its available firm power resources are already fully committed to existing contractors under applicable law and regulations, it is not feasible to replace Glen Canyon peaking with power generated at the Hoover Powerplant.

Senator BRADLEY. Let me ask Mr. Barrett, if I could. Does WAPA have an obligation to maximize revenues from the CRSP in your opinion?

Mr. BARRETT. The 1956 act places some obligation on them to maximize revenues, but we do not think that gives them an absolute primacy of power operations over any other concern.

Senator BRADLEY. Well, does that mean that you would encourage WAPA to move on differential rates for peaking versus base-load?

Mr. BARRETT. I think they already have that in their rate structure.

Senator BRADLEY. You would encourage that.

Mr. BARRETT. Yes, sir.

Senator BRADLEY. Let me ask you. What revenues were not allocated for the basin fund, for example, to include in the rate base the substantially completed sections of the Bonneville unit back in the early 1980's? What revenues were not collected because of those decisions?

Mr. BARRETT. I think, sir, the repayment obligation in CRSP is to pay back into the fund the irrigation investment which has been made. I think all the irrigation investment which has been made which is being used is now in the rate base. I am not aware of any that is actually being used which is not in the rate base. In fact, in the Central Utah Project, there is now a rate increase in process which WAPA has initiated which would put into the rate another couple of mills due to adding Central Utah Project features, and we do not have any problem with that as long as they are features which will be used some day for irrigation.

Senator BRADLEY. So, you would say that none of the decisions relating to the Bonneville unit in the early 1980's had any impact on the rate base not including certain things?

Mr. BARRETT. Only to the extent that those things were delayed into the future, and when they are built, then they will go into the rate base at the appropriate time.

Senator BRADLEY. The substantial completion versus investment?

Mr. BARRETT. Yes.

Senator BRADLEY. Does anyone on the panel want to offer a concluding thought for the subcommittee to consider prior to the adjournment of this hearing?

Mr. Graff?

Mr. GRAFF. Mr. Chairman, I just might, from bitter experience in dealing with Hoover Dam, suggest that whatever the merits of the alternative Mr. Litton recommended, the lower basin power users are unlikely to look kindly on changes in what they consider their baby. And therefore I would at least caution that that is not a simple matter to change operations there.

Senator BRADLEY. Mr. Kanner?

Mr. KANNER. As a corollary to that comment, I would point out that we appreciate the recognition that there may be a reduction in peaking capacity and that the ability to secure that through other means is certainly desirable. Federal power is not in our view subsidized. It is sold at the government's cost. There is no such thing in the electric utility industry as market rates. So, securing other resources would be very desirable.

Senator BRADLEY. Mr. Clagett?

Mr. CLAGETT. Well, I am very pleased to say that I can agree with EDF on something.

[Laughter.]

Mr. CLAGETT. I agree that the contractors from Hoover are going to feel pretty strongly about their resource.

And the corollary I guess to that is that I would like to emphasize an earlier part of my statement that we have found very little damage being caused by power operations. There is a lot of damage being blamed on power operations. We are having a lot of difficulty identifying it.

As far as the act is concerned, I would like to be complimentary about section 4. I think there might be some modifications to that, but the consultation process that is provided for in section 4 and the discussions earlier about the Northwest Act—certainly there could be some pieces put together that would come up with something that would be a good, long-term solution.

When you look at what we knew about the river and what we did, say, 5 years ago or even 10 years ago, things have changed dramatically, and we have an opportunity to learn an awful lot about that river. But the learning will continue, and the priorities will continue to change. And I would suggest 10, 20, 30 years from now, I think it would be very unfortunate if we go through these kind of a jump start arrangements where we do another environmental statement 5 or 7 years from now because there is more to learn.

When you talk about tail race management or downstream management from dams, Glen Canyon is very much setting a pace for Federal dams all over the place. It is a dam with a lot of storage, so

there is a lot of flexibility. The questions are different, but there are a lot of other dams around with a lot of storage. And I see the consultation process and the fact that the river is going to continue to flow and we should continue to make better decisions into the future, I see some real potential there.

Senator BRADLEY. Mr. Barrett, final word.

Mr. BARRETT. A couple of real quickies, sir.

CREDA really expects there will be some changes in power operations as a result of the studies which are now under way, and we are prepared to accept those and deal with them. And given enough lead time, we can probably solve the problems they create for us.

This particular piece of legislation, although I am sure it is not the intent of the drafters, does do serious violation to the NEPA process and prejudices a number of the outcomes. I think those are drafting errors and oversights which can be corrected. And I would just urge the committee to read the bill and read the words very carefully before you act on it.

Senator BRADLEY. Thank you very much, Mr. Barrett, Mr. Claggett, Mr. Kanner, Mr. Graff. Thank you all for your time.

Let me thank all of the witnesses today. I think we have had very broad participation with a healthy range of different views expressed. The subcommittee will benefit from all of your thoughts, and I appreciate your willingness to take the time to share them with us.

The subcommittee stands in adjournment.

[Whereupon, at 2:15 p.m., the hearing was adjourned.]

APPENDIX

Estimates of Economic Impacts
of Implementing Interim
Flow Release Patterns
at Glen Canyon Dam

for the
U.S. House of Representatives
Committee on Interior and Insular Affairs
Subcommittee on Water, Power and
Offshore Energy Resources

Environmental Defense Fund
Oakland, California
(415) 658 8008

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(107)

Executive Summary

Legislation has been introduced (HR4498) which would direct the Secretary of Interior to implement flow release constraints at Glen Canyon Dam on an interim basis, pending completion of the Environmental Impact Statement assessing the effect of current operations and alternatives on the Grand Canyon. This study uses a computer-based simulation model to examine the net economic impacts of changes in power system operations resulting from a set of alternative release requirement scenarios. In addition, emissions impacts of the changes are also examined.

Flow release constraints at Glen Canyon Dam do not change the overall amount of electric energy that can be generated; instead, this energy is generated at different times. There is an economic cost because there is a loss in the operating flexibility of the hydroelectric generating plant. More costly fossil-fueled powerplants must be used in a less efficient manner.

Three basic alternative flow release requirement scenarios were examined. The first scenario requires minimum releases to be raised from the current 1,000 cubic feet per second (cfs) in winter and 3,000 cfs in summer to 8,000 cfs year round. In addition, releases would not be allowed to change by more than 5,000 cfs in any one hour (currently there is no restriction on how fast releases may be increased or decreased). Power system costs are estimated to increase \$3.9 million in 1991 in this case compared to current operations.

A second alternative additionally constrains the maximum release rate to 20,000 cfs for power generation purposes, compared to the current maximum release rate of 31,500 cfs. In this case power system costs are \$4.7 million in 1991 compared to current operations.

A third alternative would require constant releases each month (that is, there would be no fluctuating flows). This alternative results in power system costs of \$8.2 million in 1991 compared to current operations.

Since the second and third alternatives constrain the generating capability of the Glen Canyon Dam below its physical capability, a measure that would increase flexibility for power operations while having only a small environmental impact is available. This would be to allow the maximum release rate to be exceeded on an emergency basis when power system reserve capacity is required to be used. With this measure the costs of the second alternative would be reduced from \$4.7 to \$3.9 million in 1991. The costs of the third alternative would be reduced from \$8.2 to 6.8 million in 1991.

These costs are a very small percentage -- significantly less than 1% -- of overall power system costs, even when allocated entirely to the utilities which currently receive Glen Canyon power.

Emissions impacts are even smaller, and in several cases positive. The change in operations slightly increases sulfur dioxide emissions, while nitrogen oxide and carbon dioxide emissions generally decrease.

Estimates of the Economic Impacts
of Implementing Interim Flow Release Patterns
at Glen Canyon Dam

I. Introduction

The United States Department of the Interior is currently preparing an Environmental Impact Statement to assess flow release patterns and proposed changes in release requirements at Glen Canyon dam. Since current operations -- which are largely geared toward optimizing power production -- are causing environmental damage within the Grand Canyon, legislation has been introduced that would impose release requirements on an interim basis, pending completion of the Environmental Impact Statement. Such interim requirements would restrict the extent to which releases would be optimized only for power production purposes, and thus could be expected to increase the economic costs of meeting power demands in the Southwest region. This study uses a computer-based utility system simulation model to forecast the magnitude of potential cost increases under several different flow release requirement scenarios.

In addition, the effects of the different release requirements on powerplant emissions of sulfur oxides, nitrogen oxides, and carbon dioxide are also forecast during the interim period 1991 through 1995.

The alternative flow release scenarios examined in this study can be compared to current operations at Glen Canyon dam. Current operations allow water to be released from the dam at a maximum rate of 31,500 cubic feet per second (cfs) for power generation purposes. (This rate can be exceeded if flood control needs require it.) The release rate must be at least as great as 1,000 cfs in winter (October through March) and at least 3,000 cfs in summer (April through September). There is no restriction on how fast releases can be changed from hour to hour (the "ramp rate").

The alternative flow release scenarios illustrate the range of impacts that may occur as a result of interim flow release requirements at Glen Canyon dam. The first alternative raises the minimum release requirement. The second alternative simultaneously reduces the maximum release. A third alternative is a maximum-cost-effect scenario: the minimum release requirement equals the maximum release requirement each month; that is, there is virtually no variation in release rates within a month.

The first alternative release scenario requires the release rate to be at least 8,000 cfs year round. The maximum rate of 31,500 cfs would be retained. In addition, the release rate could not change by more than 5,000 cfs over a

one-hour period (i.e., the ramp rate could not be greater than 5,000 cfs per hour).

The second alternative release scenario would also require a minimum release rate of 8,000 cfs year round. The maximum release rate would be restricted to 20,000 cfs for power generation purposes. The maximum ramp rate would again be 5,000 cfs per hour.

A third alternative would require near-constant releases each month. This is referred to as "baseload" operation. Release rates would vary from month to month in accord with water storage, delivery, and flood control requirements.

In addition to these three basic alternatives, this study examines two variations to the second and third alternatives. The variations concern the extent to which the physical capacity of Glen Canyon dam can be used for emergency reserve support. These variant cases allow greater flexibility in the use of Glen Canyon capacity by allowing the maximum release rate to be exceeded on those infrequent occasions when system reserve capacity must be called on. For example, current operations currently hold 114 Megawatts of Colorado River Storage Project peaking capacity for reserve support. Since the second alternative case has a normal maximum release rate of 20,000 cfs, allowing the release rate to increase to 31,500 cfs for reserve purposes creates reserve capacity of approximately 442 Megawatts. In the third alternative, baseload operation case, the level of reserve capacity created by allowing peaking generation on an emergency basis varies from month to month depending on the level of releases each month.

In summary, the cases examined are:

	Minimum release (cfs)	Maximum release (cfs)	Maximum ramp rate (cfs/hr)	Reserve capacity (MW)
Current operations	1,000/3,000	31,500	-	114
Alternatives:				
I - 8,000 cfs minimum	8,000	31,500	5,000	114
II - 8,000 min + 20,000 max	8,000	20,000	5,000	114
IIa - (with reserve capacity)	8,000	20,000	5,000	442
III - baseload	-	-	0	114
IIIa - (with reserve capacity)	-	-	0	400-850

How do these different release requirements affect power generation costs? Electric generation is most valuable at peak-load times (such as summer afternoons when air-conditioning requirements are greatest) because electric utilities typically have to call upon higher-cost generation resources to meet these higher loads. In a typical month water supply will not be great enough to allow a 31,500 cfs release rate around the clock. Instead, the value of water for power generation can be maximized by releasing the limited amount of water preferentially at peak-load times, and as little as possible at other times. The current operations release requirements allow

a great deal of flexibility to do this. The resulting fluctuating flows are the subject of the current environmental investigations.

Under alternative I, the minimum release requirement is raised to 8,000 cfs. While there is no difference in the total amount of water released from the dam in a month, and thus no difference in the total amount of energy generated, less of that total is available to be scheduled at peak-load times, since there are greater requirements for minimum releases at all times. Thus, alternative I shifts some energy generation from peak-load times to non-peak-load times. Other, higher-cost coal and natural gas resources must be turned on at peak-load times, thus increasing costs. The additional hydroelectric generation at non-peak times means that the fossil-fuel plants will generate less at these times, thereby saving money. Since the fossil-fuel plants which generate less are lower-cost resources, the off-peak savings will not be as great as the on-peak costs. In addition, the ramp-rate restriction also constrains flexibility to meet peak-load requirements.

Alternative II further restricts the ability to use Glen Canyon generation at peak-load times. Alternative III eliminates the ability to optimize hydroelectric generation for peak-time use.

Alternatives IIa and IIIa allow the full capacity of Glen Canyon dam, up to the 31,500 cfs release rate, to be used on an emergency basis. This additional flexibility means that power system operators do not have to commit more expensive, fossil-fuel resources for purposes of reserve support.

II. Study Method

This study calculates the economic effects of changes in the hour-to-hour scheduling of Glen Canyon Dam generation by simulating the operation of the most directly affected electric systems of which the Glen Canyon powerplant is a component. The interconnected western power grid which includes Glen Canyon Dam is a far-flung entity extending through British Columbia. Power from the Colorado River Storage Project (CRSP), a set of dams on the Colorado River, of which Glen Canyon is by far the major component, has regularly been sold as far away as California. This study restricts attention to the power systems most directly affected by changes in Glen Canyon generation. These include customers of Colorado River Storage Project power (municipal and publicly-owned utilities in Arizona, New Mexico, Utah, Colorado, and southern Nevada), and, for those customers which do not have their own generating plants, their alternative suppliers (generally investor-owned utilities in the same region).

The electric system simulation used in this study focuses on the real economic costs of changing operations. That is, the simulation examines the physical and resource changes involved in burning fuel and generating electricity, rather than financial changes that come with different power transactions. Thus, the increased profit that utility A may be able to make when it increases sales to utility B is not a subject of this study. The cost of the additional fuel that utility B burns to supply utility A is. This study takes a net economic impacts perspective across utilities rather than the perspective of any single utility.

A single utility or entity such as the Western Area Power Administration (which markets and distributes Colorado River Storage Project Power) will consider only its own "wins" and "losses" which result from power transactions. These transactions will ordinarily include a mark-up component (which, from an economic perspective, represents a transfer payment rather than a resource cost). "Winners" and "losers" may largely balance out when all such entities are considered. This study considers only the net loss over all such entities; it does not calculate any single entity's position.

There are several aspects of the distribution of the net economic cost that are known, however. Increases in power costs will fall on Colorado River Storage Project firm customers in either of two ways. One possibility is that the firm customers' share of Glen Canyon resources will be changed in accordance with changes in Glen Canyon operations, thereby making the power less valuable and requiring these utilities to generate or purchase make-up power at on-peak times. Alternatively, the Western Area Power Administration could continue to supply power in accord with pre-existing contracts and will itself purchase make-up power. In this case rates to firm customers will increase to cover Western's costs. For these reasons the net cost impacts per kilowatt-hour are most appropriately attributed to those kilowatt-hours delivered to firm customers.

An additional aspect of the distribution of net economic costs that is also known is the effect on the federal treasury. Since Western currently markets Glen Canyon power at a cost well below its free-market value, Western will be able to adjust firm power rates to recover any increases in its costs. Aside from slight differences in the timing of the repayment of Western's costs there is no effect on Western's payments to the federal treasury.

The simulation of the power systems is performed through the use of the Elfin computer model. The Elfin electric utility simulation model was developed by the Environmental Defense Fund, and is currently widely used in California and elsewhere in the country. Some of the users and uses of the Elfin model are summarized in Appendix 1. In this study the Elfin model simulates the operation of more than one hundred generating units in the Southwest region.

III. Results

The Elfin model measures the total costs of producing electricity for the simulated power systems for each year of the study period under each case. These costs include the costs of powerplant fuel and variable operation and maintenance expenses. (These costs do not include fixed costs such as interest, or costs such as administrative and general expenses which are not expected to change as a result of changes in Glen Canyon operations.) Table 1 shows these total production costs for each flow release scenario and year from 1991 through 1995.

In addition, table 1 calculates the change in total production costs in each case compared to the current operations case. Thus, alternative I, the

TABLE 1

Total Production Costs by Flow Release Pattern
and Water Year *

Total Costs (million \$)					
	1991	1992	1993	1994	1995
Current operations	1680.9	1793.8	1947.5	2106.5	2302.3
Alternatives:					
I - 8,000 cfs minimum	1684.7	1797.8	1952.0	2111.9	2308.8
II - 8,000 min + 20,000 max	1685.5	1800.4	1955.2	2116.8	2313.7
IIa - (with reserve capacity)	1684.7	1799.1	1953.8	2114.3	2312.4
III - Baseload	1689.0	1804.5	1960.6	2123.5	2321.3
IIIa - (with reserve capacity)	1687.7	1803.0	1958.6	2120.4	2321.3
Change From Current Operations (million \$)					
I - 8,000 cfs minimum	3.9	4.0	4.5	5.4	6.5
II - 8,000 min + 20,000 max	4.7	6.6	7.8	10.2	11.4
IIa - (with reserve capacity)	3.9	5.3	6.4	7.8	10.1
III - Baseload	8.2	10.7	13.2	17.0	19.0
IIIa - (with reserve capacity)	6.8	9.2	11.2	13.8	19.0
Change From Current Operations (percent)					
I - 8,000 cfs minimum	0.23%	0.22%	0.23%	0.25%	0.28%
II - 8,000 min + 20,000 max	0.28	0.37	0.40	0.49	0.50
IIa - (with reserve capacity)	0.23	0.29	0.33	0.37	0.44
III - Baseload	0.49	0.60	0.68	0.81	0.83
IIIa - (with reserve capacity)	0.41	0.52	0.57	0.66	0.82
Cost per kWh of CRSP Firm Sales (cents per kWh)					
I - 8,000 cfs minimum	0.07	0.07	0.08	0.09	0.11
II - 8,000 min + 20,000 max	0.08	0.12	0.14	0.18	0.20
IIa - (with reserve capacity)	0.07	0.09	0.11	0.14	0.18
III - Baseload	0.14	0.19	0.23	0.30	0.33
IIIa - (with reserve capacity)	0.12	0.16	0.20	0.24	0.33

* Water year 1991 equals October 1990 through September 1991.

8,000 cfs minimum release case, results in increased costs of \$3.9 million in 1991 compared to current operations. Alternative II, which also includes a 20,000 cfs maximum release requirement, results in a larger increase in costs, \$4.7 million in 1991. Alternative IIA, which allows additional operating flexibility during emergency conditions, mitigates the additional cost effect; the increase in costs is \$3.9 million compared to current operations.

Alternative III, the baseload flow release pattern, has the highest cost impacts. In 1991, the baseload alternative costs \$8.2 million compared to current operations. Alternative IIIa, which provides peaking capacity for emergency reserve support, reduces the additional cost to \$6.8 in 1991.

Table 1 also shows the cost increases compared to the base case as a percentage of total costs. In general, the percentage impacts increase over time. This occurs as the result of two factors: first, power system loads are forecast to increase approximately 3% per year during this period; and second, Glen Canyon hydroelectric generation is also forecast to increase, since reservoirs are currently low and water supplies are expected to increase under expected average hydrologic conditions. The first factor makes hydroelectric generation relatively more valuable over time, since increasing loads means that higher-cost thermal resources must be used to meet these loads. The second factor means that Glen Canyon hydroelectric generation is larger share of the generation "mix," and any constraint on the operational flexibility of this resource will have a greater relative impact.

Finally, the last section of table 1 shows the impact of the cost increases on Colorado River Storage Project firm customers. These impacts are calculated on a cost per kilowatt-hour basis. For example, alternative I would increase costs to CRSP firm customers by 0.07 cents per kilowatt-hour in 1991. Since the rates for CRSP firm power average approximately 1 cent per kilowatt-hour currently, this represents an approximately 7% increase in the cost of CRSP power. These figures overstate the cost impact of the changes, however. The cost of CRSP power represents on average only a small fraction of the total costs of the utilities which receive this power. These utilities generate or purchase the balance of their power requirements from other sources, and in addition have interest costs, distribution system costs, operation and maintenance costs, and so forth. Thus, the increase in rates to the residential and business customers of these utilities is small indeed; on average less than 0.3% in this case.

Figure 1 charts the change in total costs for each case compared to current operations by year.

Tables 2 through 4 show powerplant emissions results under each case. Table 2 shows sulfur dioxide emissions, table 3 shows nitrogen oxide emissions, and table 4 shows carbon dioxide emissions. Sulfur dioxide emissions increase in the alternative cases, while in many cases nitrogen oxide emissions decrease. Carbon dioxide emissions decrease in the alternative cases. The decreases in carbon dioxide emissions occur because of shifts from coal-fired generation (which emits proportionately more carbon dioxide) to natural gas-fired generation. Carbon dioxide emission rates per

FIGURE 1

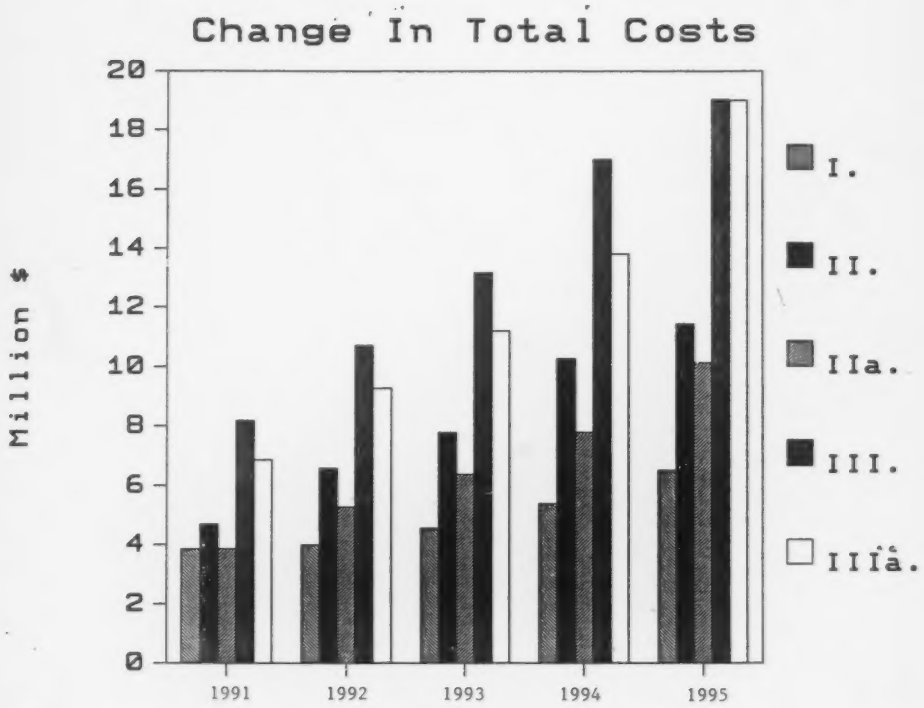


TABLE 2

SO₂ Emissions by Flow Release Pattern and Year

	System SO ₂ (tons)				
	1991	1992	1993	1994	1995
Current operations	257263	260853	266175	273038	281021
Alternative I	257495	260988	266632	273774	281704
Alternative II	257103	260844	266672	273721	281816
Alternative IIa	257487	261252	266964	274082	282055
Alternative III	257189	261165	266925	274050	282257
Alternative IIIa	257460	261546	267419	274461	282948

Change From Current Operations (tons)					
Alternative I	232	135	458	737	683
Alternative II	-161	-9	497	684	795
Alternative IIa	223	399	789	1044	1034
Alternative III	-74	312	750	1012	1235
Alternative IIIa	197	693	1244	1424	1927

Change From Current Operations (percent)					
Alternative I	0.09%	0.05%	0.17%	0.27%	0.24%
Alternative II	-0.06	0.00	0.19	0.25	0.28
Alternative IIa	0.09	0.15	0.30	0.38	0.37
Alternative III	-0.03	0.12	0.28	0.37	0.44
Alternative IIIa	0.08	0.27	0.47	0.52	0.69

TABLE 3

NOx Emissions by Flow Release Pattern and Year

	System NOx (tons)				
	1991	1992	1993	1994	1995
Current operation	337634	342820	348493	356382	363839
Alternative I	337422	342583	348252	356166	363645
Alternative II	337169	342423	348460	356229	364145
Alternative IIa	337242	342550	348193	356097	363547
Alternative III	336984	342376	348370	355978	364607
Alternative IIIa	336934	342399	348352	356038	363829

Change From Current Operations (tons)					
Alternative I	-212	-237	-241	-216	-194
Alternative II	-465	-398	-33	-153	306
Alternative IIa	-392	-270	-299	-285	-292
Alternative III	-650	-444	-123	-404	767
Alternative IIIa	-700	-422	-140	-344	-10

Change From Current Operations (percent)					
Alternative I	-0.06%	-0.07%	-0.07%	-0.06%	-0.05%
Alternative II	-0.14	-0.12	-0.01	-0.04	0.08
Alternative IIa	-0.12	-0.08	-0.09	-0.08	-0.08
Alternative III	-0.19	-0.13	-0.04	-0.11	0.21
Alternative IIIa	-0.21	-0.12	-0.04	-0.10	0.00

TABLE 4

CO2 Emissions by Flow Release Pattern and Year

System CO2 (millions of tons)					
	1991	1992	1993	1994	1995
Current operation	98.93	100.46	102.30	104.48	106.71
Alternative I	98.92	100.44	102.27	104.46	106.70
Alternative II	98.85	100.42	102.29	104.45	106.74
Alternative IIa	98.87	100.44	102.26	104.45	106.69
Alternative III	98.79	100.40	102.27	104.42	106.83
Alternative IIIa	98.79	100.42	102.28	104.43	106.77

Changes From Current Operations (thousands of tons)					
Alternative I	-17.18	-24.60	-27.30	-20.30	-10.20
Alternative II	-87.72	-46.40	-5.80	-25.40	25.20
Alternative IIa	-67.10	-27.30	-35.90	-30.20	-25.60
Alternative III	-141.60	-58.90	-30.60	-53.00	120.90
Alternative IIIa	-140.00	-45.20	-18.70	-47.00	58.10

Change From Current Operations (percent)					
Alternative I	-0.02%	-0.02%	-0.03%	-0.02%	-0.01%
Alternative II	-0.09	-0.05	-0.01	-0.02	0.02
Alternative IIa	-0.07	-0.03	-0.04	-0.03	-0.02
Alternative III	-0.14	-0.06	-0.03	-0.05	0.11
Alternative IIIa	-0.14	-0.05	-0.02	-0.04	0.05

Btu of fuel do not vary significantly among coal plants, nor do they vary among natural gas plants. On the other hand, sulfur dioxide emission rates vary from coal plant to coal plant depending on the sulfur content of the coal fuel. These increases would be relatively easy and inexpensive to mitigate by including emissions factors in the optimization criteria used to operate the power system.

IV. Conclusion

Changes in flow release patterns at Glen Canyon dam which restrict the degree to which these flow releases can be optimized purely for power generation purposes do increase power system generating costs in the southwest region. More restrictive flow release patterns cause greater increases in cost. The cost increases range from \$3.9 million dollars per year in 1991 under an 8,000 cfs minimum release requirement to a maximum of \$8.2 million dollars per year in 1991 under a baseload alternative. The greater increases in cost can be mitigated to some extent by allowing operating flexibility on an emergency basis.

Only one kind of operating flexibility increase was considered in this study: allowing higher maximum release rates for emergency reserve purposes. There are other methods of increasing operating flexibility which should be considered for both power generation and environmental goals. For example, monthly water releases are determined by the Bureau of Reclamation considering goals primarily for water delivery and flood control. To the extent there is remaining flexibility in month-to-month water releases these will be scheduled to optimize power generation. With changes in daily flow release patterns these month-to-month schedules could be re-optimized. Such re-optimization, which could further reduce the costs of changing flow release patterns, was not examined in this study.

In addition, flow release patterns which enhance environmental protection may be less generally constraining than the flow release patterns examined in this study. For example, protection of fish species may require restrictive flow release patterns at only certain times during the year.

An additional method of ameliorating cost impacts was also not considered in this study: energy efficiency improvements. Given the low price of Colorado River Storage Project power, utility customers have had relatively little incentive to promote energy conservation and load management among their residential and business consumers. Current research points to significant remaining potentials for energy efficiency improvements among electricity users at costs below the costs of thermal generation. Load management, by cutting peak-period electric demands, has the potential to directly mitigate the effects of restricting peak-period generation at Glen Canyon dam. Potential cost savings from increased energy efficiency would quickly outweigh the cost increases due to changing flow release patterns at Glen Canyon dam.

Appendix 1

- Study Method

A. Power Systems Simulation

1. The Elfin Model

The method used in this study to calculate the economic costs of changing operations at Glen Canyon dam is to simulate changes in Glen Canyon electric generation within the context of the power systems most directly affected by those changes. Since these power systems involve more than a hundred electric generating units in portions of seven states, and since power system operations are extremely complex, a computer-based model is necessary for this task.

The "Elfin" electric utility production cost simulation model is used in this study. The Elfin model was developed by the Environmental Defense Fund. The model is currently the primary analysis tool used by the staffs of both the California Public Utilities Commission and the California Energy Commission. The Southern California Edison Company uses Elfin as its primary tool for long-range planning. In addition, Elfin is used by a number of consulting and engineering firms in California and elsewhere.

The Elfin model is used by these organizations for a variety of purposes related to the operation of electric generation systems. For example, before the California Public Utilities Commission Elfin is used to make short-term (one year) forecasts of fuel use and marginal energy costs for purposes of setting electric rates and "Qualifying Facility" (cogeneration and independent power producer) purchase prices. The model is also used by both of the California regulatory commissions and others to do long-term planning. For example, the model is used to determine what new plants would be most cost effective. It is also used to determine what levels of conservation and demand-side management would be most cost effective.

In addition, the Elfin model has been recommended for use, along with the Electric Power Research Institute's EGEAS model, in the Department of Interior's Environmental Impact Statement process currently under way for Glen Canyon operations. The Glen Canyon Environmental Studies' Power Economics Team, of which the Environmental Defense Fund is a participating member, conducted "prototype" studies to determine acceptable methods for calculating the economic impacts of changes in operations at Glen Canyon dam. Three different methods were compared: the Western Area Power Administration's "Alternative Thermal Plant" method; the EGEAS model; and the Elfin model. The prototype studies using each of these methods were conducted by Western Area Power Administration, Stone & Webster Management Associates, and the Environmental Defense Fund, respectively. The Alternative Thermal Plant method was judged to be less useful than either of the models because only the models could take into account the complexity and range of impacts involved in the power system. The EGEAS model was favored because of its ability to make

"optimum generation expansion decisions" in the long run, when new generating capacity may be necessary to replace lost peaking capacity from Glen Canyon (since there is currently significant excess capacity in the southwest region the issue of new generating capacity is not particularly relevant to interim operating conditions at Glen Canyon). The Elfin model was recommended as a valuable cross-check for EGEAS results.

2. What the Elfin Model Does

The Elfin electric utility production simulation model simulates the production of electricity by generating units to meet customer demands. The Elfin model begins with the "load shape"-- the hour-by-hour demand for electricity. The model then uses data on the electric generating plants available to meet load to simulate how these plants will be operated. Data such as the capacity of each plant, the type and cost of fuel each plant uses (or the availability of water for hydroelectric generation), the efficiency of each plant, and the maintenance requirements and reliability of each plant are used in the simulation. The simulation is "probabilistic;" an important factor in the operation of electric systems is the outages of generating units due to mechanical breakdowns. Since such outages cannot be forecast except on an average, expected basis, the model weighs the probability of each combination of outage events in calculating its results.

The model simulates the operation of electric systems with essentially the same goal as power system operators: to meet electric needs at minimum cost subject to constraints on reliability, operating flexibility, and other factors. The Elfin model includes a "commitment" algorithm and a "spinning reserve" algorithm. The commitment algorithm decides when slow-start plants must be committed for reliability purposes (that is, when each slow-start plant must be started up, with the constraint that in order to be available for peak-period loads, such plants must remain running at a minimum level during non-peak times). The spinning reserve algorithm decides when quick-start units (such as combustion turbines), which would otherwise not be economic, must be brought on-line to meet operating reserve requirements.

B. System Definition for the Elfin Simulations

In this study, the Elfin model simulates operations on a month-by-month basis, with each month represented by a "typical week" within that month.

This monthly simulation is conducted for power systems covering portions of seven states. The Colorado River Storage Project (CRSP), of which Glen Canyon dam is the major component, has over one-hundred customers for firm electric power, mostly in Arizona, New Mexico, Utah, Colorado and southern Nevada. Most of these customers are small utilities which have no generating resources of their own, but purchase power from larger neighboring utilities when they have needs in excess of their firm contract power. Consequently all major utilities and thermal generating units in these states are potentially affected by a change in operations at Glen Canyon. (Interconnected utilities also own plants or portions of plants in Wyoming and Texas.)

The simulated system consists of 70 coal-fired units, 3 nuclear generating units, 58 oil- or gas-fired steam turbines or combined-cycle units, a large number of combustion turbines, all CRSP units (including, of course, Glen Canyon), most of the non-federally owned hydro projects in the region and two pumped-storage plants.

All of these systems are modelled as an interconnected, bulk system in the Elfin simulations for this study. While significant portions of the system are subject to a formal power pooling agreement that coordinates reserve capacity sharing and economy energy transactions, there are still significant transmission constraints and coordination constraints within the larger interconnected area. The transmission and coordination constraints have been approximated within this study's Elfin simulations by insuring that certain minimum levels of local generation would occur in each sub-area. This is accomplished by making plants in each sub-area "must-run" plants, which must be committed for local generation and reliability purposes regardless of economics.

The bulk-system simulation used in this study is not as sophisticated as the approach recommended for the Environmental Impact Statement by the Power Economics Team. The recommended approach is to model a number of utilities which receive Glen Canyon power on a utility-by-utility basis, taking specific account of their interconnections with neighboring utilities. This detailed approach is deemed necessary in order to measure utility-specific impacts of both changes in Glen Canyon generation and changes in Colorado River Storage Project firm contracts. Neither sufficiently detailed data nor time were available for such a detailed approach in this study; since neither utility-specific impacts nor changes in firm contracts are of interest in this study, such a detailed approach was deemed unnecessary.

The Western Area Power Administration (WAPA) is in charge of marketing and distributing CRSP power. Since actual energy and capacity available from CRSP generating units varies from year-to-year with hydrological conditions, and this energy and capacity may be greater or less than WAPA's firm contract obligations, WAPA also conducts transactions in order to meet its firm contract obligations, or to sell surpluses above the firm contract amounts. The Elfin simulations do not separate these transactions in any special way. Instead, such transactions are modelled concurrently with other system power flows.

C. Notes on Data and Sources

As described above, the Elfin production cost model dispatches generating resources subject to operating constraints in order to serve customer load as economically as possible. Thus, both loads and resources must be specified in the system input data file.

Specifications for thermal plants include:

- maximum capacity
- minimum capacity
- minimum down time
- heat rates at various capacity levels
- maintenance rates
- forced outage rates
- fuel costs
- operation and maintenance costs

Specifications for hydro plants include:

- maximum capacity
- minimum capacity
- available energy
- ramp rate restrictions (Glen Canyon alternative case only)

Specifications for customer load include:

A "typical week" load curve of 168 points, each representing 1 hour, for each month.

Data sources include:

Western Area Power Administration, letter dated July 9, 1990, from Lloyd Greiner to Thomas J. Graff.

Summary of Loads and Resources, Western Systems Coordinating Council, Jan 1, 1990

Electrical World, Directory of Electrical Utilities, McGraw Hill, 1990.

National Utility Reference File (NURF) database, U.S. Environmental Protection Agency, 1985, 1986, 1987.

Input data file for SERAM, Southwest Energy and Resource Availability Model, California Energy Commission, 1990.

Fuels Report, California Energy Commission, November 1989.

Elfin input data files for Southern California Edison and Los Angeles Department of Water and Power, Electricity Report 90, California Energy Commission, June 1990.

Elfin input data file for Southern California Edison, California Public Utilities Commission case U 338-E, "Forecast of Operations of the Energy Cost Adjustment Clause for a January 1, 1991 Revision Date (Workpapers)", Southern California Edison Company, June 1990.

EGEAS data file summaries, Stone & Webster Management Associates, for the following utilities:

- Salt River Project
- Arizona Public Service
- Tucson Electric Power Company
- Public Service Company of New Mexico
- Public Service Company of Colorado
- Tri-State Generation and Transmission
- Plains Electric and Transmission
- Platte River Power Authority
- City of Colorado Springs
- Colorado Ute Electric Association
- Nevada Power Company
- Utah Power and Light

Load data were derived from the SERAM input file, which provides state-by-state loads and resources for Arizona, New Mexico, Utah, and Colorado, and includes Tri-State Generation and Transmission Co-op (which includes a portion of Wyoming) and El Paso Electric Company (which includes a portion of Texas). Load data for southern Nevada were derived from the EGEAS summaries. Aggregate load growth in the 1991 through 1995 period averages 2.9% per year for peak loads, and 3.1% per year for energy.

Spinning reserve requirements and commitment targets were set to Western Systems Coordinating Council criteria of 7% of load.

Monthly operating plan data for Glen Canyon were developed by the Bureau of Reclamation and provided by the Western Area Power Administration.

Monthly generation figures for other CRSP projects and SLCA/IP units were held at average levels for each month.

Plant data were derived primarily from the EGEAS summaries, and were cross-checked against the SERAM file, the Electrical World Directory, and the NURF database.

Fuel cost data for coal-fired units were derived primarily from the SERAM data file prepared by the California Energy Commission. These figures are based primarily on Energy Information Administration (EIA) data for 1989, plus escalation rates forecast by the California Energy Commission. Since the EIA data report average fuel prices, which include both fixed- and variable-cost components, these fuel prices tend to overestimate the cost effect of changes in coal-fired generation. Exceptions were fuel costs for the Mohave, Four Corners, and Intermountain units, where variable-cost prices in 1991 were available from the Elfin file created by Southern California Edison Company.

Natural gas fuel cost data were based on the "California Border Price" forecast of the California Energy Commission Fuels Report. These data exclude transportation costs within California. Since these figures include all transportation charges to the California border, and most southwest gas-fired

units are closer to the natural gas sources, it is likely that these prices overestimate the cost effect of changes in gas-fired generation.

The following table presents the average coal and gas prices used in the Elfin base-case simulation. Since coal prices are plant-specific the table presents generation-weighted average prices. The natural gas price applies to all gas-fired plants in the simulation.

Fuel Prices		
(nominal \$/MBtu)		
Water year*	Coal	Natural Gas
1991	1.25	2.08
1992	1.32	2.19
1993	1.42	2.36
1994	1.51	2.56
1995	1.61	2.78
Average escalation rate, 1991-1995	6.5%/yr	7.5%/yr

* 1991 = October 1990 through September 1991

Appendix 2

Results -- Details

Table A1 presents generation by fuel type in each of the cases.

Table A2 presents system marginal costs by time-of-day period and month in the current operations case.

Table A1

Generation by Fuel Type and
by Flow Release Pattern and Year
(GWh)

Current Operations	1991	1992	1993	1994	1995
Nuclear	16060.4	16332.7	16306.4	16327.6	16312.9
Coal	84176.5	85495.8	86781.8	88585.5	90231.5
Gas/Oil	3827.7	3826.1	4418.4	5175.3	5974.4
Alternative I	1991	1992	1993	1994	1995
Nuclear	16050.5	16332.4	16306.4	16327.6	16312.9
Coal	84002.3	85314.0	86576.4	88386.3	90048.9
Gas/Oil	4048.4	4045.8	4657.6	5407.6	6193.0
Alternative II	1991	1992	1993	1994	1995
Nuclear	16122.6	16332.5	16306.4	16327.6	16313.0
Coal	83874.9	85177.0	86484.3	88234.6	89918.0
Gas/Oil	4102.0	4190.1	4759.3	5571.7	6337.7
Alternative IIa	1991	1992	1993	1994	1995
Nuclear	16122.8	16332.4	16306.4	16327.6	16312.9
Coal	83944.0	85264.8	86505.3	88306.7	89943.9
Gas/Oil	4032.9	4102.1	4734.2	5495.1	6306.8
Alternative III	1991	1992	1993	1994	1995
Nuclear	16195.1	16319.7	16301.1	16325.0	16200.4
Coal	83676.1	85023.5	86289.4	88011.2	89843.1
Gas/Oil	4249.2	4379.8	4987.3	5818.2	6540.4
Alternative IIIa	1991	1992	1993	1994	1995
Nuclear	16195.6	16319.7	16301.1	16325.0	16200.3
Coal	83746.8	85119.3	86361.7	88118.7	89825.6
Gas/Oil	4177.3	4284.7	4911.1	5707.6	6554.4

Table A2

Average Marginal Costs by Subperiod and Month

		(mills/kWh)											
1991	Month												
	Annual	10	11	12	1	2	3	4	5	6	7	8	9
Weekday pk	19.8	19.4	18.7	19.2	20.1	21.0	20.9	19.7	18.8	19.4	20.8	21.0	18.3
Weeknights	15.7	14.5	15.2	16.0	17.3	18.1	17.7	16.1	14.5	13.7	15.1	15.5	14.4
Sat. day	19.3	18.8	18.5	19.1	20.0	20.9	20.8	19.0	18.3	18.5	20.8	20.2	17.2
Weekend other	16.9	16.1	16.5	17.2	18.1	18.7	18.6	17.1	15.7	15.6	17.5	17.2	14.9
Average	18.3	17.6	17.5	18.1	19.1	19.9	19.7	18.3	17.2	17.3	18.9	19.0	16.7
1992	Month												
	Annual	10	11	12	1	2	3	4	5	6	7	8	9
Weekday pk	21.1	20.5	19.6	19.8	21.2	22.2	22.5	21.5	21.4	20.6	22.0	22.2	19.6
Weeknights	15.3	16.1	16.9	16.6	19.5	18.9	17.1	16.0	14.7	16.2	16.6	15.4	
Sat. day	20.5	19.9	19.4	19.6	21.0	22.1	22.3	20.8	20.8	19.4	21.8	21.1	18.2
Weekend other	18.1	17.0	17.4	18.0	19.4	20.1	19.9	18.3	17.5	16.6	18.6	18.2	15.9
Average	19.5	18.6	18.4	18.8	20.2	21.1	21.2	19.9	19.4	18.4	20.0	20.1	17.8
1993	Month												
	Annual	10	11	12	1	2	3	4	5	6	7	8	9
Weekday pk	23.1	21.8	21.0	21.1	23.5	24.5	24.6	23.7	23.6	23.3	24.2	24.3	22.2
Weeknights	18.3	16.3	17.2	18.1	20.5	21.3	20.6	18.8	17.4	16.2	17.6	18.2	17.0
Sat. day	22.5	21.1	20.7	21.0	23.2	24.1	24.3	22.5	22.8	21.9	24.4	23.8	20.2
Weekend other	19.7	18.1	18.6	19.2	21.3	21.9	21.7	20.1	19.1	18.4	20.7	20.3	17.4
Average	21.3	19.8	19.7	20.1	22.4	23.2	23.1	21.8	21.3	20.6	22.1	22.1	19.9
1994	Month												
	Annual	10	11	12	1	2	3	4	5	6	7	8	9
Weekday pk	25.4	24.6	23.7	23.6	25.7	27.0	27.2	26.0	25.9	24.3	26.3	26.2	24.0
Weeknights	19.8	18.0	19.3	20.2	22.1	23.4	22.4	20.1	18.6	17.1	18.7	19.2	18.3
Sat. day	24.8	23.7	23.3	23.3	25.2	26.7	27.0	24.8	25.0	23.7	26.8	26.0	21.8
Weekend other	21.5	20.1	20.9	21.4	23.1	24.1	23.7	21.7	20.6	19.8	22.4	21.9	18.8
Average	23.3	22.2	22.2	22.4	24.3	25.6	25.4	23.8	23.1	21.8	23.9	23.8	21.5
1995	Month												
	Annual	10	11	12	1	2	3	4	5	6	7	8	9
Weekday pk	28.2	27.2	26.2	25.9	28.8	30.4	30.3	29.3	29.2	26.4	29.0	28.6	26.6
Weeknights	21.6	19.4	20.7	21.8	24.7	26.3	25.1	22.3	20.3	18.4	20.2	20.6	19.8
Sat. day	27.5	26.4	25.8	25.6	28.2	29.8	30.2	28.0	28.1	26.2	29.8	28.6	23.9
Weekend other	23.7	22.0	22.7	23.3	25.7	27.0	26.6	24.2	22.8	21.7	24.7	24.0	20.4
Average	25.8	24.4	24.3	24.5	27.2	28.7	28.4	26.6	25.9	23.8	26.4	26.0	23.6

A STATEMENT BY THE NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION
BEFORE THE WATER AND POWER SUBCOMMITTEE
ENERGY AND NATURAL RESOURCES COMMITTEE
UNITED STATES SENATE
GRAND CANYON PROTECTION ACT
JULY 24, 1990

Mr. Chairman, my name is Morgan Dubrow, Chief Engineer of the National Rural Electric Cooperative Association (NRECA). NRECA is the national association of over 1000 rural cooperatives which supply central station electricity to some 25 million people in the rural areas of 46 states.

This statement sets forth NRECA's opposition to S.2807, the so-called "Grand Canyon Protection Act of 1990."

Mr. Chairman, the Grand Canyon is a very special place. It touches all who see it in a unique and special way. Last week, two visitors from New Zealand, Arthur and Dot Ainsworth, who stopped to see their friend Don Smith, Chief Economist at NRECA, had on their agenda a visit to the Grand Canyon. The protection of the inspirational beauty and majesty of the Grand Canyon is a responsibility Americans must accept on behalf of mankind.

Mr. Chairman, whether there are 3,000 cubic feet per second (cfs), 8,000 cfs, or 30,000 cfs flowing in the Colorado River at the bottom of the Grand Canyon has nothing to do with the beauty and majesty of the Grand Canyon. In fact, the magnificence of the Grand Canyon dwarfs the substance of the current contentiousness over river flows. One can stand on the south rim of the Grand Canyon, and the river is barely visible below. S.2807 and companion legislation in the House of Representatives is not about the beauty, majesty, and magnificence of the Grand Canyon.

If one is interested in the protection of the environment in the Grand Canyon, understanding that the Colorado River is part of the environment of the Canyon, then one would await the outcome of the Environmental Impact Study (EIS) that is currently underway by the U.S. Bureau of Reclamation. Obviously, that study will identify the environmental impacts to the river and the canyon due to a variety of operational conditions at Glen Canyon Dam, including the current operational conditions. The EIS will help determine what is the best operational criteria for the Glen Canyon Dam, or what we might do to mitigate environmental damages if any to the river and the canyon. Maybe the operations at the Dam ought to be changed. But, it is also quite possible that other things can be done to mitigate environmental impacts without changing operations at the Glen Canyon Dam.

If, however, one is interested in changing the use of the Colorado River (and perhaps other rivers as well) to de-emphasize hydroelectric production and agricultural use of water, and place a higher priority on municipal, recreational, and environmental use of water, then pursuing S.2807 and companion legislation in the House prior to the completion of the EIS makes sense. That concept of changing the priorities for usage of the Colorado River has been freely advocated by special purpose organizations, including in the publication "Troubled Waters: Managing Water in America's West", published in October 1986, by the World Resources Institute.

NRECA recognizes that society's needs and interests shift over time. Government should address those changing circumstances. Water rationing in California communities is a problem for all of us to help solve, because we may have a bigger problem next time. Recreation is essential for society and can provide commercial economic opportunities in rural areas. However, changing basic federal policies for managing water ought to be done through a process like that advocated by Senator Hatfield in S.1996. It should not be done under the "smoke screen" of an emergency condition to avert major damage to the Grand Canyon.

NRECA continues to believe that clean, renewable hydro-power serves the national interest and its production should be emphasized over less clean sources. Glen Canyon Dam, with a capacity of 1356 MW, supplies power to 58 rural electric cooperatives and other preference customers in the Upper Colorado River Basin. Moreover, the Glen Canyon powerplant supplies about 70 percent of all the power that can be generated at Colorado River Storage Project (CRSP) dams in the upper Colorado River Basin. Glen Canyon power is co-mingled with large amounts of power from fossil-fired plants to serve residential farms and ranches despite this co-mingling of relatively inexpensive hydropower, the rates for these preference customers are still high.

To the extent that water flows from Glen Canyon are changed in the fashion prescribed in S.2807, the electric capacity and energy will have to be replaced with fossil-fueled units. That appears to be the opposite of the direction Congress and the Administration are taking in the clean air deliberations soon to be completed.

It is imperative that rural electric systems such as those purchasing CRSP power maintain access to this relatively low-cost power to help offset the higher rates from today's steam plants. Escalating electric rates to consumers is of growing concern to our member systems. According to reports by the Rural Electrification Administration (REA), 79 percent of rural electric systems nationwide have higher rates than those of neighboring utilities. Consequently, any additional increases in their cost of purchasing power impacts on their consumer members and the communities they serve.

Attached is Table I that indicates the comparative retail rate between each rural electric cooperative receiving power from Glen Canyon and its neighboring utility. This Table does not reflect the Western Area Power Administration's (WAPA) recently announced 46 percent rate increase which will obviously make power costs to these cooperatives substantially higher.

Table II provides the average per capita income for each rural electric cooperative member who depends on Glen Canyon Dam for part of its energy supply, and compares that to the statewide and national average. These are rural people including Indian tribes that are having a difficult time providing an adequate living for themselves. S.2807 and companion legislation in the House will make it more difficult for these people. These are the people who will pay the costs of changed or reduced power output from Glen Canyon, perhaps as much as \$30 million per year according to WAPA estimates.

Table III provides a breakdown by cooperative of the category of uses for the power. Those categories are residential, commercial, industrial, and irrigation. As is plainly evident, the dramatically increased costs proposed by S.2807 will affect people in their homes and at their livelihoods.

In summation, NRECA believes the environmental interests of the Colorado River and Grand Canyon ecosystems is best served by the Environmental Impact Statement process. Further, NRECA believes S.2807 and companion legislation in the House of Representatives represent unwise economic policy and resource use for the region, and will contribute to air pollution. NRECA opposes S.2807.

TABLE 1: Residential Rate Comparison at 1,000 kWh*

07/23/90

	Rural Electric Co-op (REC)	REC Rate (cents per kWh)	IOU Rate (cents per kWh)	Percent Difference	Investor-Owned Utility (IOU)
1) AZ013	NAVOPACHE ELECTRIC COOPERATIVE	10.24	8.77	16.76%	arizona psc
2) AZ029	ELECTRICAL DISTRICT NO 2	7.92	8.77	-9.71%	arizona psc
3) CO007	GRAND VALLEY RURAL POWER LINES	6.54	7.18	-8.91%	psc of colorado
4) CO014	SAN LUIS VALLEY RURAL ELECTRIC	7.10	7.18	-1.10%	psc of colorado
5) CO015	MORGAN COUNTY RURAL ELEC. ASSN	7.80	7.18	8.71%	psc of colorado
6) CO016	INTERMOUNTAIN RURAL ELECTRIC	7.93	7.18	10.56%	psc of colorado
7) CO017	SOUTHEAST COLORADO POWER ASSN.	8.70	7.18	21.25%	psc of colorado
8) CO018	GUNNISON COUNTY ELECTRIC ASSN.	6.86	7.18	-4.46%	psc of colorado
9) CO020	DELTA MONTROSE ELECTRIC ASSN.	7.83	7.18	9.16%	psc of colorado
10) CO025	SAN ISABEL ELECTRIC ASSN.	7.70	7.18	7.26%	psc of colorado
11) CO026	SAN MIGUEL POWER ASSN. INC.	8.04	7.18	12.04%	psc of colorado
12) CO029	HIGHLINE ELECTRIC ASSN.	6.05	7.18	-15.68%	psc of colorado
13) CO031	POUDRE VALLEY REA INC.	6.72	7.18	-6.31%	psc of colorado
14) CO032	LA PLATA ELECTRIC ASSN.	6.89	7.18	-3.97%	psc of colorado
15) CO033	EMPIRE ELECTRIC ASSN INC.	6.68	7.18	-6.89%	psc of colorado
16) CO034	HOLY CROSS ELECTRIC ASSOC.	6.33	7.18	-11.78%	psc of colorado
17) CO035	SANGRE DECRISTO ELECTRIC ASSN.	7.74	7.18	7.93%	psc of colorado
18) CO036	YAMPA VALLEY ELECTRIC ASSN.	6.09	7.18	-15.12%	psc of colorado
19) CO037	MOUNTAIN VIEW ELECTRIC ASSN.	8.01	7.18	11.65%	psc of colorado
20) CO038	Y-W ELECTRIC ASSOCIATION INC.	7.45	7.18	3.76%	psc of colorado
21) CO039	K. C. ELECTRIC ASSOCIATION	7.46	7.18	3.97%	psc of colorado
22) CO040	WHITE RIVER ELECTRIC ASSN INC.	6.31	7.18	-12.01%	psc of colorado
23) CO042	MOUNTAIN PARKS ELECTRIC, INC.	6.83	7.18	-4.88%	psc of colorado
24) NE001	ROOSEVELT PUBLIC POWER DIST.	0.00	0.00	0.00%	
25) NE003	CHIMNEY ROCK PUBLIC POWER DIST	8.32	5.65	47.18%	nebraska pp district
26) NE084	PANHANDLE RURAL ELECTRIC	7.51	5.65	32.87%	nebraska pp district
27) NE100	WHEAT BELT PUBLIC POWER DIST.	8.80	5.65	55.67%	nebraska pp district
28) NM004	CENTRAL VALLEY ELECTRIC CO-OP	8.04	5.60	43.69%	s.w. ps- new mexico
29) NM008	ROOSEVELT COUNTY ELECTRIC	7.83	5.60	39.85%	s.w. ps- new mexico
30) NM009	FARMERS' ELECTRIC COOPERATIVE	8.33	5.60	48.84%	s.w. ps- new mexico
31) NM011	KIT CARSON ELECTRIC CO-OP	10.05	8.90	12.96%	psc of new mexico
32) NM012	OTERO COUNTY ELECTRIC CO-OP	10.80	6.76	59.72%	texas new mexico pc
33) NM014	MORA-SAN MIGUEL ELECTRIC CO-OP	11.85	8.90	33.13%	psc of new mexico
34) NM015	NORTHERN RIO ARRIBA ELECTRIC	12.32	8.90	38.43%	psc of new mexico
35) NM017	SIERRA ELECTRIC COOPERATIVE	11.15	8.90	25.32%	psc of new mexico
36) NM019	SPRINGER ELECTRIC COOPERATIVE	10.49	5.60	87.51%	s.w. ps- new mexico
37) NM020	SOCORRO ELECTRIC COOPERATIVE	7.46	8.90	-16.15%	psc of new mexico
38) NM021	CENTRAL NEW MEXICO ELECTRIC	11.40	8.90	28.13%	psc of new mexico
39) NM022	CONTINENTAL DIVIDE ELECTRIC	9.36	8.90	5.24%	psc of new mexico
40) NM023	LEA COUNTY ELECTRIC CO-OP	6.48	5.60	15.74%	s.w. ps- new mexico
41) NM025	COLUMBUS ELECTRIC COOPERATIVE	8.25	8.90	-7.27%	psc of new mexico
42) NM026	SOUTHWESTERN ELECTRIC CO-OP	14.40	5.60	157.33%	s.w. ps- new mexico
43) NM028	JEMEZ MOUNTAINS ELECTRIC CO-OP	6.58	8.90	-26.08%	psc of new mexico
44) NV004	OVERTON POWER DISTRICT NO. 5	2.66	5.29	-49.70%	nevada pc
45) NV017	LINCOLN COUNTY POWER DISTRICT	2.95	5.29	-44.21%	nevada pc
46) NV018	VALLEY ELECTRIC ASSN.	5.66	8.18	-30.78%	so. california edison
47) UT008	MOON LAKE ELECTRIC ASSN.	7.39	8.56	-13.64%	utah p & l
48) UT020	DIXIE-ESCALANTE RURAL ELECTRIC	4.34	8.56	-49.30%	utah p & l
49) WY003	RIVERTON VALLEY ELECTRIC ASSN.	6.39	5.46	17.06%	pacific p&l - wyoming
50) WY005	BIG HORN RURAL ELECTRIC CO-OP	6.46	5.46	18.31%	pacific p&l - wyoming
51) WY006	WYRULEC COMPANY	7.21	5.46	32.20%	pacific p&l - wyoming
52) WY010	WHEATLAND RURAL ELECTRIC ASSN.	7.88	5.46	44.34%	pacific p&l - wyoming
53) WY012	GARLAND LIGHT AND POWER CO.	7.39	5.46	35.48%	pacific p&l - wyoming
54) WY014	RURAL ELECTRIC COMPANY	6.65	5.46	21.90%	pacific p&l - wyoming
55) WY016	HOT SPRINGS COUNTY REA, INC.	5.89	5.46	7.94%	pacific p&l - wyoming

TABLE 1: Residential Rate Comparison at 1,000 kWh*

07/23/90

	Rural Electric Co-op (REC)	REC Rate (cents per kWh)	IOU Rate (cents per kWh)	Percent Difference	Investor-Owned Utility (IOU)
56) WY021	CARBON POWER AND LIGHT INC.	7.39	5.46	35.41%	pacific p&l - wyoming
57) WY022	NIOBRARA ELECTRIC ASSN., INC.	8.48	5.46	55.48%	pacific p&l - wyoming
58) WY024	SHERIDAN-JOHNSON RURAL ELEC.	7.97	5.46	46.08%	pacific p&l - wyoming

Number of RECs with Higher Rates: 37

more than 40% higher 10
 20% to 40% higher 11
 0 to 20% higher 16

Number of RECs with Lower Rates: 20

0 to 20% lower 15
 20% to 40% lower 2
 more than 40% lower 3

*1,000 kWh is an average monthly residential use
 Source: REA

NRECA Economics Division

TABLE 2: 1988 Per Capita Incomes of REC Consumers
Rural Electric Cooperative (REC) Service Areas

	REA#	REC	Per Capita Income (\$)
1)	AZ013	NAVOPACHE ELECTRIC COOPERATIVE	8,367
2)	AZ029	ELECTRICAL DISTRICT NO 2	11,022
		REC Average	9,695
		AZ State Average	14,983
		US Average	16,490
		No. RECs Lower than State Average:	2
1)	CO007	GRAND VALLEY RURAL POWER LINES	13,038
2)	CO014	SAN LUIS VALLEY RURAL ELECTRIC	10,602
3)	CO015	MORGAN COUNTY RURAL ELEC. ASSN	12,942
4)	CO016	INTERMOUNTAIN RURAL ELECTRIC	17,849
5)	CO017	SOUTHEAST COLORADO POWER ASSN.	15,024
6)	CO018	GUNNISON COUNTY ELECTRIC ASSN.	12,694
7)	CO020	DELTA MONTROSE ELECTRIC ASSN.	11,676
8)	CO025	SAN ISABEL ELECTRIC ASSN.	11,502
9)	CO026	SAN MIGUEL POWER ASSN. INC.	14,385
10)	CO029	HIGHLINE ELECTRIC ASSN.	15,425
11)	CO031	POUDRE VALLEY REA INC.	14,997
12)	CO032	LA PLATA ELECTRIC ASSN.	12,936
13)	CO033	EMPIRE ELECTRIC ASSN INC.	11,999
14)	CO034	HOLY CROSS ELECTRIC ASSOC.	22,524
15)	CO035	SANGRE DECRISTO ELECTRIC ASSN.	12,303
16)	CO036	YAMPA VALLEY ELECTRIC ASSN.	15,672
17)	CO037	MOUNTAIN VIEW ELECTRIC ASSN.	15,785
18)	CO038	Y-W ELECTRIC ASSOCIATION INC.	17,811
19)	CO039	K. C. ELECTRIC ASSOCIATION	20,186
20)	CO040	WHITE RIVER ELECTRIC ASSN INC.	13,786
21)	CO042	MOUNTAIN PARKS ELECTRIC, INC.	15,188
		REC Average	14,682
		CO State Average	16,459
		US Average	16,490
		No. RECs Lower than State Average:	17
1)	NE001	ROOSEVELT PUBLIC POWER DIST.	14,022
2)	NE003	CHIMNEY ROCK PUBLIC POWER DIST	13,803
3)	NE084	PANHANDLE RURAL ELECTRIC	15,194
4)	NE100	WHEAT BELT PUBLIC POWER DIST.	15,971
		REC Average	14,748
		NE State Average	14,793
		US Average	16,490
		No. RECs Lower than State Average:	2

TABLE 2: 1988 Per Capita Incomes of REC Consumers
Rural Electric Cooperative (REC) Service Areas

REA#	REC	Per Capita Income (\$)
1)	NM004 CENTRAL VALLEY ELECTRIC CO-OP	12,266
2)	NM008 ROOSEVELT COUNTY ELECTRIC	10,790
3)	NM009 FARMERS' ELECTRIC COOPERATIVE	11,310
4)	NM011 KIT CARSON ELECTRIC CO-OP	9,447
5)	NM012 OTERO COUNTY ELECTRIC CO-OP	11,791
6)	NM014 MORA-SAN MIGUEL ELECTRIC CO-OP	8,614
7)	NM015 NORTHERN RIO ARRIBA ELECTRIC	8,542
8)	NM017 SIERRA ELECTRIC COOPERATIVE	11,384
9)	NM019 SPRINGER ELECTRIC COOPERATIVE	11,812
10)	NM020 SOCORRO ELECTRIC COOPERATIVE	9,511
11)	NM021 CENTRAL NEW MEXICO ELECTRIC	10,975
12)	NM022 CONTINENTAL DIVIDE ELECTRIC	8,302
13)	NM023 LEA COUNTY ELECTRIC CO-OP	12,401
14)	NM025 COLUMBUS ELECTRIC COOPERATIVE	9,792
15)	NM026 SOUTHWESTERN ELECTRIC CO-OP	14,876
16)	NM028 JEMEZ MOUNTAINS ELECTRIC CO-OP	9,643
	REC Average	10,716
	NM State Average	12,493
	US Average	16,490
	No. RECs Lower than State Average:	15
1)	NV004 OVERTON POWER DISTRICT NO. 5	16,979
2)	NV017 LINCOLN COUNTY POWER DISTRICT	14,801
3)	NV018 VALLEY ELECTRIC ASSN.	14,786
	REC Average	15,522
	NV State Average	17,525
	US Average	16,490
	No. RECs Lower than State Average:	3
1)	UT008 MOON LAKE ELECTRIC ASSN.	10,796
2)	UT020 DIXIE-ESCALANTE RURAL ELECTRIC	9,737
	REC Average	10,267
	UT State Average	12,189
	US Average	16,490
	No. RECs Lower than State Average:	2
1)	WY003 RIVERTON VALLEY ELECTRIC ASSN.	11,366
2)	WY005 BIG HORN RURAL ELECTRIC CO-OP	11,868
3)	WY006 WYRULEC COMPANY	12,441
4)	WY010 WHEATLAND RURAL ELECTRIC ASSN.	11,588
5)	WY012 GARLAND LIGHT AND POWER CO.	13,785
6)	WY014 RURAL ELECTRIC COMPANY	13,686

TABLE 2: 1988 Per Capita Incomes of REC Consumers
Rural Electric Cooperative (REC) Service Areas

REA#	REC	Per Capita Income (\$)
7)	WY016 HOT SPRINGS COUNTY REA, INC.	13,332
8)	WY021 CARBON POWER AND LIGHT INC.	13,195
9)	WY022 NIOBRARA ELECTRIC ASSN., INC.	14,442
10)	WY024 SHERIDAN-JOHNSON RURAL ELEC.	13,322
	REC Average	12,903
	WY State Average	13,641
	US Average	16,490
	No. RECs Lower than State Average:	7

Source: Bureau of Economic Analysis (BEA) data

NRECA Economics Division
July 1990

TABLE 3: Sales by Rural Electric Systems
(as pct of total)

07/23/90

System	City	Resi- dential	Comm.	Ind.	Irr.
1) AZ013	NAVOPACHE ELECTRIC COOPERATIVE	44	34	17	5
2) AZ029	ELECTRICAL DISTRICT NO 2	14	5	14	67
3) CO007	GRAND VALLEY RURAL POWER LINES	68	31	0	1
4) CO014	SAN LUIS VALLEY RURAL ELECTRIC	30	13	7	51
5) CO015	MORGAN COUNTY RURAL ELEC. ASSN	25	32	0	41
6) CO016	INTERMOUNTAIN RURAL ELECTRIC	67	27	4	1
7) CO017	SOUTHEAST COLORADO POWER ASSN.	24	10	4	15
8) CO018	GUNNISON COUNTY ELECTRIC ASSN.	47	22	8	0
9) CO020	DELTA MONTROSE ELECTRIC ASSN.	49	27	14	0
10) CO025	SAN ISABEL ELECTRIC ASSN.	28	14	41	0
11) CO026	SAN MIGUEL POWER ASSN. INC.	41	36	23	0
12) CO029	HIGHLINE ELECTRIC ASSN.	19	14	0	65
13) CO031	POUDRE VALLEY REA INC.	36	15	46	2
14) CO032	LA PLATA ELECTRIC ASSN.	49	43	7	0
15) CO033	EMPIRE ELECTRIC ASSN INC.	23	22	54	0
16) CO034	HOLY CROSS ELECTRIC ASSOC.	49	36	2	0
17) CO035	SANGRE DECRISTO ELECTRIC ASSN.	66	26	8	0
18) CO036	YAMPA VALLEY ELECTRIC ASSN.	43	31	25	1
19) CO037	MOUNTAIN VIEW ELECTRIC ASSN.	63	18	3	2
20) CO038	Y-W ELECTRIC ASSOCIATION INC.	16	25	0	57
21) CO039	K. C. ELECTRIC ASSOCIATION	25	24	0	50
22) CO040	WHITE RIVER ELECTRIC ASSN INC.	16	19	64	0
23) CO042	MOUNTAIN PARKS ELECTRIC, INC.	47	21	30	0
24) NE001	ROOSEVELT PUBLIC POWER DIST.	74	12	0	14
25) NE003	CHIMNEY ROCK PUBLIC POWER DIST	57	19	0	23
26) NE084	PANHANDLE RURAL ELECTRIC	33	7	3	56
27) NE100	WHEAT BELT PUBLIC POWER DIST.	25	10	25	36
28) NM004	CENTRAL VALLEY ELECTRIC CO-OP	13	53	12	22
29) NM008	ROOSEVELT COUNTY ELECTRIC	26	43	0	30
30) NM009	FARMERS' ELECTRIC COOPERATIVE	42	33	0	23
31) NM011	KIT CARSON ELECTRIC CO-OP	52	32	16	0
32) NM012	OTERO COUNTY ELECTRIC CO-OP	55	33	11	1
33) NM014	MORA-SAN MIGUEL ELECTRIC CO-OP	67	23	10	0
34) NM015	NORTHERN RIO ARriba ELECTRIC	48	33	18	0
35) NM017	SIERRA ELECTRIC COOPERATIVE	53	42	0	1
36) NM019	SPRINGER ELECTRIC COOPERATIVE	20	17	51	0
37) NM020	SOCORRO ELECTRIC COOPERATIVE	35	36	28	0
38) NM021	CENTRAL NEW MEXICO ELECTRIC	62	32	0	5
39) NM022	CONTINENTAL DIVIDE ELECTRIC	26	33	40	0
40) NM023	LEA COUNTY ELECTRIC CO-OP	9	67	12	10
41) NM025	COLUMBUS ELECTRIC COOPERATIVE	9	8	76	7
42) NM026	SOUTHWESTERN ELECTRIC CO-OP	2	1	97	0
43) NM028	JEMEZ MOUNTAINS ELECTRIC CO-OP	53	44	2	0
44) NV004	OVERTON POWER DISTRICT NO. 5	40	57	0	1
45) NV017	LINCOLN COUNTY POWER DISTRICT	1	2	12	6
46) NV018	VALLEY ELECTRIC ASSN.	46	32	0	22
47) UT008	MOON LAKE ELECTRIC ASSN.	8	55	37	1
48) UT020	DIXIE-ESCALANTE RURAL ELECTRIC	40	6	34	20
49) WY003	RIVERTON VALLEY ELECTRIC ASSN.	24	44	29	2
50) WY005	BIG HORN RURAL ELECTRIC CO-OP	29	38	29	4
51) WY006	WYRULEC COMPANY	32	10	24	29
52) WY010	WHEATLAND RURAL ELECTRIC ASSN.	21	4	60	10
53) WY012	GARLAND LIGHT AND POWER CO.	76	11	0	12
54) WY014	RURAL ELECTRIC COMPANY	31	31	0	28
55) WY016	HOT SPRINGS COUNTY REA, INC.	6	28	65	1

TABLE 3: Sales by Rural Electric Systems
(as pct of total)

07/23/90

System		City	Resi- dential	Comm.	Ind.	Irr.
56) WY021	CARBON POWER AND LIGHT INC.	SARATOGA	40	37	16	4
57) WY022	NIOBRARA ELECTRIC ASSN., INC.	LUSK	23	30	33	12
58) WY024	SHERIDAN-JOHNSON RURAL ELEC.	SHERIDAN	23	27	48	2
Average			32%	30%	24%	10%

Source: REA

NRECA Economics Division

PREPARED STATEMENT OF JONI BOSH, ON BEHALF OF SIERRA CLUB, ARIZONA FLYCASTERS, ARIZONA WHITEWATER ASSOCIATION, FRIENDS OF ARIZONA RIVERS, HUACHUCA AUDUBON SOCIETY, MARICOPA AUDUBON SOCIETY, MOTHERS FOR CLEAN WATERS, NORTHERN ARIZONA AUDUBON SOCIETY, PRESCOTT AUDUBON SOCIETY, TROUT UNLIMITED AND TUCSON AUDUBON SOCIETY

Mr. Chairman and members of the Subcommittee,

My name is Joni Bosh, and I live in Phoenix, Arizona. I have prepared this statement on S. 2807 on behalf of several Arizona-based conservation groups as well as for the Sierra Club, which has 7300 members in Arizona and which I represent as a member of our national Board of Directors. Please accept this testimony for the record on this important legislation.

We support this legislation as a major step towards protecting for generations to come one of the world's great natural treasures, the Grand Canyon, and its associated ecosystem. Our suggestions are meant to assure that the purposes for which this legislation has been introduced are fulfilled.

This bill does not attempt to remove Glen Canyon dam nor to alter the "Law of the River" relating to allocation of Colorado River water. We accept those important constraints so that we may focus on a more critical issue, and that is how the water is released from the dam on an hourly and daily basis to generate electrical power.

The Bureau of Reclamation's own 1988 Glen Canyon Environmental Studies State that current operations of the dam "have substantial adverse effects on downstream resources" because of extreme variations in water flows to serve power demands. The river level changes daily as much as 13 feet, with often two peaks per day. This places in jeopardy the remaining beaches and associated riparian vegetation, cultural sites and wildlife communities, habitat for endangered and sport fish, and the safety and opportunity for boating.

In practice, the Bureau of Reclamation is giving primacy to generating power, over protection of downstream values in the Grand Canyon. In our opinion, and that of the Bureau's own regional solicitor, this is not legal and it certainly is not what literally thousands of citizens told the Bureau at public hearings earlier this year. While the Bureau has finally agreed to start addressing downstream effects of dam operations through an environmental impact statement, it did so only after intense pressure from the public and from Congress, including this Subcommittee and the sponsors of this bill. Although it clearly is within the Bureau's authority to do so, the agency has yet to commit to anything to change this situation other than more study of the problem. Quite simply, this legislation is needed because of the Bureau's well-documented failure to take actions necessary to protect the Grand Canyon in a timely manner.

S. 2807 should require that protective interim flows be established now. This is advocated by both the Environmental Protection Agency and the Bureau's Senior Scientist for their current research effort, who has said that interim flows "would not only help protect the canyon, but would not have much of an impact" on the ongoing data collection. Each day without change in dam operations is another day of beach erosion, habitat destruction and loss of irreplaceable values in the Grand Canyon. The option for the Secretary to postpone interim flows for yet another year should be dropped from this legislation as unwarranted.

S. 2807 should continue to focus on changing how the dam is operated and not accept alternatives which would alter the Grand Canyon further, including new dams. Proposals have been made to build a new dam downstream of Glen Canyon dam to reregulate the water flows, to dredge a channel up the river to accommodate boats in low water and to construct new beaches with camping pads, along with other similar ideas. These schemes are designed to protect the power interests who benefit from the current "peaking power" regime at Glen Canyon dam, but do so at the expense of the Grand Canyon ecosystem downstream. The goal of protecting the Grand Canyon should be met first and foremost by managing the flows from Glen Canyon dam.

S. 2807 should include a research program with a regular review of dam operations. The required monitoring may not be enough to address long-term effects, which will not be known until after the EIS period is completed and which may require significant further study and specific research flows according to the scientists involved. Already the Bureau is behind in providing promised funding to hire researchers for the current EIS study flow period. A regular process of reviewing dam operations against how well they meet the goals of protecting downstream values is essential to accommodate new information. The Bureau now reviews dam operations on an annual and five-year basis, and this would provide a good opportu-

nity to judge how well this legislation is being implemented. However, for this review to be meaningful, future power contracts should allow for these potential periodic changes in dam operations.

S. 2807 should assure that all the values of the Grand Canyon are protected—environmental, recreational and cultural. The goal of this legislation should be to protect the entire Grand Canyon ecosystem and its associated values from further destruction by dam operations. The Grand Canyon National Park staff has identified their key values along the river in descending order of importance as sediment (including beaches and cultural resources dependent on beach stability), endangered and other native fishes, native fauna, riparian vegetation, recreation and the trout fishery.

S. 2807 should require that the costs of meeting the requirements of this bill come from dam power revenues, not the general taxpayer. The power revenues are an assured source of funds needed for environmental studies and mitigation, and taking care of the Grand Canyon should be considered the cost of doing business at a Federal dam. Even using inflated Department of Energy figures adds just a fraction of a cent per kilowatt hour to Glen Canyon power, and the electricity would still be a bargain compared to other sources.

Finally, we would like to express our appreciation to the sponsors of this legislation, Senators John McCain and Dennis DeConcini, for leading the way in saving the Grand Canyon from further destruction. We also wish to thank this Subcommittee for taking up this legislation in a timely manner. We are ready to work with you to gain enactment of the Grand Canyon Protection Act as soon as possible this year. Thank you for this opportunity to comment on the bill.

PREPARED STATEMENT OF RUSS BOVAIRD, ON BEHALF OF TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC., ON S. 2807

My name is Russ Bovaird. I represent Tri-State Generation and Transmission Association with headquarters in Denver, Colorado. Tri-State is a consumer-owned, non-profit wholesale supplier of electricity to 24 rural electric systems in Colorado, Wyoming and Nebraska. Approximately 25% of our firm power resources is provided by the Colorado River Storage Project.

S. 2807 duplicates what we believe to be the existing responsibility and authority of the Secretary of Interior in Section 4 that provides discretionary authority to the Secretary to order interim power operating criteria at Glen Canyon Dam. The Secretary can do this within existing laws and agreements if he determines that existing scientific data is adequate to make a judgment. In the alternative, he can wait until the research flow data is available or, he can postpone the decision to order interim operating criteria if he believes additional evaluation time or additional data is needed.

It is important to note that the Department of Energy, acting through the Western Area Power Administration (Western) and in cooperation with the U.S. Bureau of Reclamation, has executed 15-year power sales contracts with preference customers for the power generated by the Colorado River Storage Project (CRSP). Glen Canyon Dam provides about 80% of the CRSP resource marketed through these long term contracts.

These power contracts are and have been relied upon by the power customers as significant firm power resources with historically defined and justified costs associated with that power. Interim operating criteria or permanently ordered long-term operating criteria could substantially affect the characteristics of the resource and result in serious disruptions of the resource to the power customers, as well as create havoc with their power costs. We believe that the long-term power contracts with Western should be upheld at the expense of the Federal Government in the event that the Federal Government unilaterally decides to change the conditions of those contracts by either changing the characteristics of the resource or by causing new, unexpected cost burdens to the power customers.

We support the Section of S. 2807 that provides that all direct costs of preparing the environmental impact statement be non-reimbursable. We request that direct costs be defined to include replacement power costs caused by the Secretary of Interior's decisions to change the operating criteria at the Glen Canyon Dam for any reason during the term of the power sales contracts.

PREPARED STATEMENT OF EDWARD R. OSANN, DIRECTOR, WATER RESOURCES PROGRAM,
NATIONAL WILDLIFE FEDERATION, ON S. 2807

My name is Edward R. Osann. I am Director of the Water Resources Program of the National Wildlife Federation (NWF). Please accept the Federation's views on S. 2807 for the record of the Subcommittee on Water and Power. The Federation, with over 5.8 million members and supporters, and affiliates in 51 states and territories, including each of the Colorado Basin states, is the nation's largest citizen conservation-education organization. NWF has been actively involved in environmental issues related to the Colorado River and its water management for many years. The Federation and its affiliates have sought management improvements at Glen Canyon Dam for more than a decade.

The Federation strongly supports S. 2807, and believes its passage is necessary to assure adequate protection of the priceless resources of Grand Canyon National Park. This legislation establishes standards for Glen Canyon Dam operations to assure long-term protection of the Grand Canyon and its associated resources. The bill also requires the Secretary of the Interior to establish appropriate interim flows to protect the riverine and riparian environments of the Grand Canyon while the Bureau of Reclamation prepares an Environmental Impact Statement (EIS) on the dam's operation. Finally, this bill provides the guidance necessary for comprehensive and timely completion of the analysis required by the National Environmental Policy Act (NEPA). We would suggest a few changes in the legislation to ensure that canyon resources are fully protected.

Mr. Chairman, today's hearing follows more than 15 years of litigation, scientific studies, and bureaucratic foot-dragging regarding ongoing adverse impacts to the Grand Canyon resulting from operations at Glen Canyon Dam. For several years, the level of the Colorado River below Glen Canyon Dam has risen and fallen as much as 13 feet daily due to the "peaking power" operations at Glen Canyon Dam. The Department of the Interior's own studies have concluded that "flood releases and fluctuating releases from the dam have had substantial adverse effects on downstream resources. Despite findings that "dam operations could be modified to reduce the resource losses occurring under current operations," no action has been taken to halt the ongoing degradation of the Grand Canyon's riverine environment. The Bureau has opposed taking such action before next year, even though its senior scientists have stated that damage could be averted with a different flow regime, without interference with necessary research flows.

Although we appreciate that this matter is finally being addressed in an EIS, we have serious doubts that the environmental problems resulting from dam operations will be adequately resolved without this legislation. After nine months, three different EIS coordinators, and several false starts, the Bureau finally completed scoping hearings for the EIS in May. Just two-and-a-half weeks ago, the Bureau held a separate "alternatives brainstorming session" to which only selected members of the public were invited. Contrary to the policy of the CEQ regulations that promote open public participation throughout the EIS process, no public notice was issued for this meeting. S. 2807 will provide much-needed statutory direction to protect the Grand Canyon environment and to help assure the ultimate success of the NEPA process.

S. 2807 is needed to clarify, in unmistakable terms, the longstanding commitment of the Federal Government to protect and enhance the ecological and recreational resources of Grand Canyon National Park.

Despite several Federal laws that charge the Secretary with protecting and improving conditions for recreation, fish and wildlife, and endangered species in the Grand Canyon, the Secretary and the Bureau of Reclamation have systematically delayed development and implementation of measures to address these requirements. While the Federation believes that the Secretary's mandate to protect the Grand Canyon is already clear, S. 2807 would provide needed guidance on standards and procedures to implement such protection. This bill would succinctly declare the Secretary's responsibility to operate Glen Canyon Dam "in such a manner as to protect, mitigate adverse impacts to, and improve the natural resources of Grand Canyon National Park and Glen Canyon National Recreation Area."

S. 2807 also would put to rest a primary argument raised by the Western Area Power Administration in an April 26, 1988 legal memorandum, that power generation must have primacy over environmental resources. We believe this argument is erroneous on its face. However, WAPA's view has established an interdepartmental conflict that must be resolved before final action can be taken on Grand Canyon environmental issues. The Federation strongly supports the reasoning of the Interior Department's Intermountain Regional Solicitor in a June 6, 1988 memorandum

to the Bureau, stating that the Secretary has discretion to alter operations of Glen Canyon Dam if resource considerations require changes. S. 2807 would explicitly resolve any conflict over this issue.

S. 2807 is also fully consistent with protection policies previously adopted by Congress. The Secretary's approach to the management of Glen Canyon Dam and its impacts on the Grand Canyon must be guided by the "fundamental purpose" of the National Parks, to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations, National Park Service Organic Act, 16 U.S.C. § I, and by other laws related to establishment and management of Grand Canyon National Park and Glen Canyon NRA. The Secretary is bound by law to encourage the recovery of endangered species in areas affected by Glen Canyon Dam operations. The Secretary must also recognize the international importance of these Park resources as a designated World Heritage site by United Nations Convention, and identified by Congress as a "natural feature of national and international significance", as stated in the Grand Canyon National Park Enlargement Act. Id. § 227.

While we believe that the Secretary's existing statutory mandate to protect the Grand Canyon is clear, we support the provisions of S. 2807 that specify how the Secretary should implement such protection. It appears that direction from Congress is now required. Otherwise, the indecision that has characterized the Bureau of Reclamation's handling of these issues for nearly a decade will plague the remainder of the EIS process while damage continues.

The Secretary should be required by law to modify Glen Canyon Dam operations on an interim basis to quickly minimize the on-going damage to Grand Canyon resources.

We strongly support the bill's requirement that the Secretary must adopt interim operating criteria and interim flow requirements to minimize and reduce ongoing resource damage while the deliberations over the EIS and the permanent operating criteria proceed. We suggest, however, that the bill be modified to require adoption of interim flows within 90 days after enactment, as required in the House bill, H.R. 4498.

As currently structured, section 4 of S. 2807 requires the Secretary to make a finding regarding whether sufficient information is currently available to set interim operating criteria. We believe that those findings have already been made. Federal scientists have stated in the Glen Canyon Environmental Studies and in testimony before the House that they already have sufficient information to set less damaging flows. Continued failure to adopt interim operating criteria, particularly regarding flow releases, will allow further resource degradation, thus violating a fundamental principle of NEPA that the environmental status quo should be maintained until analysis and a decision on agency action can be completed. The final date for setting such interim criteria should be set 90 days after enactment, rather than allowing the Secretary to postpone action until September 1, 1991.

We agree with the premise that interim flows must be subordinate to special test flows required to carry out the EIS and other studies authorized in section 5. The bill should be amended to ensure that scientific research flows necessary for data gathering will not be impaired or affected by interim flow requirements. This could be achieved simply by adding the words "or section 5" to the end of section 4(f). A primary failure of the Glen Canyon Environmental Studies has been the fact that virtually no controlled flows for scientific studies have been allowed. We recommend that the legislative history of the bill expressly recognize this past failing and encourage the Secretary to provide all research flows necessary for a credible, technically sound EIS.

This legislation also should be amended to include specific minimum flow requirements and limits on the range and rate of daily fluctuations of releases to take effect upon enactment. These specific flows would be subject to change only upon a finding by the Secretary that other flows would better meet the requirements in section 3 of the bill. On the basis of numerous discussions over the past year with scientists that have been involved with or are familiar with the Glen Canyon Environmental Studies, the GCES Phase I study results, and testimony before the House subcommittee, it would appear that such requirements could be identified for inclusion in this legislation.

The GCES Final Report identified five ways that Glen Canyon Dam operations "could be modified to protect or enhance environmental and recreational resources," and included flow regimes designed to protect targeted resources: endangered humpback chub, common native fisheries, trout, beaches/terrestrial vegetation/wildlife, and fishing/whitewater recreation. Higher minimum flows (than the

current 1000 cubic feet per second (cfs) in winter months and 3000 cfs in summer months) and reductions or eliminations of fluctuations characterize the scenarios presented. In addition, all minimum flows presented were equal to or greater than 8,000 cfs, with the exception of a 5,000 cfs minimum flow for 3 months of summer flows for common native fishes. The Director of the U.S. Fish and Wildlife Service testified before the House that resources could be protected in winter months by a minimum flow of 8,000 cfs. This is strong evidence for establishing the interim minimum flow at 8,000 cfs in the bill. Furthermore, internal National Park Service documents indicate that agency resource scientists have recommended that an interim minimum flow of at least 8,000 cfs be set "as a means of minimizing resource and recreational impacts for the duration of the NEPA process and GCES Phase II studies." U.S. Fish and Wildlife Service officials have stated publicly that if it becomes clear that the final EIS cannot be completed in 1991, then interim flows should be implemented immediately.

The Federation believes that interim minimum flows of at least 8,000 cfs should be established as a part of this legislation, along with moderation of the range and rate of daily fluctuations. We urge the Subcommittee to seek out the views of resource agencies such as the National Park Service, the Fish and Wildlife Service, and the Arizona Game and Fish Department on the appropriate requirements for interim flows.

S. 2807 should be amended to make clear that new criteria must be set for flood releases as well as power operations in order to protect downstream resources.

The legislative findings in section 2 of S. 2807 reflect the scientific findings of the Glen Canyon Environmental Studies that flood releases have adverse impacts at least as severe as the adverse impacts of fluctuating releases from the dam for power production. The operating criteria for the dam must be modified to prevent future floods from occurring with the frequency with which they occurred during the early 80's.

Before the dam was constructed, spring floods along the Colorado River through the Grand Canyon were the norm. Each year, uncontrolled flooding would scour the canyon. But the sandy habitat along the beaches in the canyon would also be replaced each year with sediment carried by the river and deposited along its banks throughout the canyon. Now, with the dam in place, the river no longer carries new sediment into the canyon from the Upper Colorado Basin to replace lost beaches. The sediment carried by the river from the upper basin settles out in the upper reaches of Lake Powell. Lake Powell is essentially a clear-water lake.

The water released from Glen Canyon Dam is always clear, carrying much less sediment than the natural flow of the Colorado River. If the dam is not operated to prevent flooding, that water is released at much higher rates, rushing through the canyon and picking up sediment from along the banks and beaches that normally lie above the riverbed. Streamside habitat is destroyed with little chance of recovery because the clear river water can no longer replace lost sediment during the remainder of the year.

This damage to riparian habitat was documented in the Glen Canyon Environmental Studies. As it happened, there were three high water years during the period of the studies. These high water years required that significant volumes of water be sent through the spillways. The scientists had difficulty obtaining controlled water releases to study the effects of normal flows under daily power releases, but they had ample opportunity to study the effects of the floods, which were devastating. The Final Report concluded that "[c]urrent knowledge indicates that even a frequency as low as one flood in twenty years will produce a net long-term loss of camping beaches and substrate, although at a rate reduced from that caused by current operations."

At the time that these three years of flooding occurred, the water level in Lake Powell was maintained at a level that would lead to spring flood releases from the dam about once every four years. Operations have since been modified by the Bureau so that flooding will occur about once in every 20 years. Although the Bureau's unilateral action in this regard is helpful, the Bureau still views the reduction in flood frequency as discretionary.

S. 2807 should be amended to mandate that the control of flood releases must be a part of the Secretary's determination of operating criteria that will protect the resources of Grand Canyon National Park. Currently, the legislation refers throughout to modifications of "power operating criteria," an undefined term that might be taken to refer only to daily power operations and not to monthly and annual operations that affect flood frequency. We would urge that the bill be amended to delete the word "power" from this phrase wherever it appears, to assure that flood re-

leases will be considered in the Secretary's determination of operating criteria to protect, mitigate damage to, and improve the resources of the canyon.

S. 2807 should be modified to make the costs of the Glen Canyon Dam EIS reimbursable.

Section 5(d) of S. 2807 states that the costs of preparing the EIS shall be nonreimbursable. In other words, the costs of determining how Glen Canyon Dam should be operated to protect Grand Canyon resources would be borne, not by those who benefit from the purchase of low-cost Federal power, but by the American taxpayer. This runs contrary to the "polluter pays" policy, where resource conservation and social equity are both advanced by internalizing environmental costs into the cost of the product.

For years Glen Canyon Dam has been operated in a manner that is profitable to the customers of power produced at the dam, at the expense of every American's heritage in the natural, cultural and recreational resources of the Grand Canyon. The American people should not have to pay to find out how badly they've been hurt, or how best that harm can be reduced. Those power users who benefit from the privilege of purchasing inexpensive power from the dam should pay to determine how best the dam should be operated. No other allocation of the cost would be fair.

S. 2807 should be amended to make the costs of the EIS fully reimbursable. Such costs will also include any costs of purchased power needed to meet the obligations of the Federal Government under its contracts with the power users. These costs are reimbursable under all of the government's standard contracts with its power customers.

To the extent that the demand for electric power during peak periods influences the parameters of the EIS and its recommendations, the Bureau must take into account those distribution and allocation policies which could serve to reduce this demand.

The Federation applauds the provisions in the bill that set a time limit of three years for the EIS. We recommend that section 5(a) be expanded to ensure that an analysis of opportunities for conservation and demand management of electric power be included in the EIS. One of the fundamental problems inherent in the current management of Glen Canyon Dam for hydroelectric power generation is the utter lack of focus on management of peak power demand. With some of the lowest power rates in the country, the purchasers of power from the dam have little incentive to conserve. Much of the impact of modified dam operations on power customers and the power grid could be averted through aggressive conservation and demand management programs by the Bureau and the Western Area Power Administration.

No NEPA waiver is necessary for the determination of interim flow conditions from Glen Canyon Dam.

Some have suggested that this legislation should be amended to provide that the National Environmental Policy Act (NEPA) is deemed to have already been complied with for interim changes in flows from the dam. NWF opposes this and any similar language that would imply a legislative waiver of the requirements of NEPA. The interim flow criteria are not likely to require preparation of a full environmental impact statement, because they will involve only a temporary modification in flows pending a final flow regime that will follow the EIS already underway. The interim flows will be set in a manner deliberately designed to minimize impacts on the environment pending completion of the EIS. Such a temporary action designed to minimize environmental impacts does not warrant review in an EIS. NWF anticipates that an environmental assessment by the Bureau pursuant to NEPA will reveal that no EIS is necessary for the interim flow criteria.

CONCLUSION

Mr. Chairman, the Federation heartily thanks Senators McCain, DeConcini, and Bradley for sponsoring S. 2807, and the Water and Power Subcommittee for its prompt consideration of this timely legislation to preserve the resources of Grand Canyon National Park. We strongly support this bill. We urge the subcommittee to strengthen its provisions to include specific interim flow levels, assure that flood releases will be controlled over the long term, and make the Glen Canyon EIS fully reimbursable. Thank you once again for this opportunity to present the Federation's views.